VLS-4600 Series Fluid Section Manual

MagnumVenusProducts

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Terms & Conditions of Sale:

GSSC, Inc.'s Terms & Conditions of Sale ("Terms & Conditions") 588284v4

1. ACCEPTANCE: Acceptance of any purchase order from a customer or potential customer ("Buyer") is subject to credit approval by GSSC, Inc. ("Seller"), acceptance of the purchase order by Seller and, when applicable, any manufacturer, vendor, or other third party that provides goods to Seller for resale to Buyer ("Vendor"). If Seller, in its sole discretion, determines that Buyer's credit becomes unsatisfactory or it has reasonable grounds for insecurity, Seller reserves the right, upon notice to Buyer, to demand adequate assurance of due performance from Buyer and/or terminate any purchase order with no liability to Seller. BY REQUESTING A QUOTE FROM SELLER, ACCEPTING AN INVOICE FROM SELLER, OR PRESENTING A PURCHASE ORDER TO SELLER, BUYER CONFIRMS THAT THESE TERMS & CONDITIONS SHALL GOVERN ALL PURCHASES OF PRODUCTS OR MATERIALS PROVIDED TO BUYER BY SELLER ("GOODS"). GOODS SOLD BY SELLER ARE EXPRESSLY SUBJECT TO THE TERMS AND CONDITIONS SET FORTH HEREIN AND ANY DIFFERENT OR ADDITIONAL TERMS OR CONDITIONS SET FORTH IN A PURCHASE ORDER OR SIMILAR COMMUNICATION RECEIVED FROM BUYER ARE OBJECTED TO AND SHALL NOT BE BINDING UPON SELLER UNLESS SPECIFICALLY AGREED TO IN WRITING BY AN AUTHORIZED CORPORATE OFFICER OF SELLER.NO SELLER EMPLOYEE OR AGENT HAS THE AUTHORITY TO MODIFY THESE TERMS & CONDITIONS VERBALLY. SELLER OBJECTS TO AND REJECTS ANY TERMS BETWEEN BUYER AND ANY OTHER PARTY, AND NO SUCH TERMS, INCLUDING BUT NOT LIMITED TO ANY GOVERNMENT REGULATIONS OR "FLOWDOWN" TERMS, SHALL BE A PART OF OR INCORPORATED INTO ANY PURCHASE ORDER FROM BUYER TO SELLER, UNLESS AGREED TO IN WRITING BY AN AUTHORIZED REPRESENTATIVE OF SELLER.

2. PRICES AND TAXES: Buyer agrees to pay the prices quoted by Seller or listed on any related invoice, and is responsible for additional applicable shipping and handling charges, taxes, duties, and charges for import and export licenses and certificates. All prices quoted by Seller are subject to change without notice. Seller will generally collect applicable taxes along with the purchase price unless Buyer submits a valid tax exemption certificate, and indicates which Goods are covered by it. Prices on special-order Goods may be subject to change before shipment. In order to be corrected, any discrepancies in pricing and/or quantities on invoices must be reported by Buyer within thirty (30) days of the invoice date.

3. PAYMENT: Payment terms are 30 days net from the invoice date or upon such other terms approved by Seller in writing. Retainage shall not apply, and Buyer shall not hold back any retainage from Seller, even if retainage is part of any contract between Buyer and any other party. Payment is not contingent on Buyer's ability to collect or obtain funds from any other party. Credit card sales are billed at the time of purchase. Buyer expressly represents it is solvent at the time it places any purchase order with Seller. Seller, in its sole discretion, may determine that Buyer's financial condition requires full or partial payment prior to manufacture or shipment. If Buyer fails to make any payment when due, Seller reserves the right to suspend performance. Buyer agrees to pay a charge on all amounts past due at the rate of 1 ½% per month (18% per year) or the maximum lawful rate, whichever is less. In the event of non-payment, Buyer agrees to pay Seller's reasonable attorney fees and court costs, if any, incurred by Seller to collect payment, and all applicable interest charges. Seller may apply payments to any outstanding invoices unless Buyer provides specific payment direction.

4. TITLE AND RISK OF LOSS OR DAMAGE: As to Goods delivered directly by Seller, title passes upon delivery at the place Buyer receives possession; and, thereafter, all risk of loss or damage shall be on Buyer. All other sales are F.O.B., point of shipment, and Buyer takes title and assumes responsibility for risk of loss or damage at the point of shipment for such sales. Claims for Goods damaged in transit are Buyer's sole responsibility when not delivered directly by Seller.

5. QUOTATIONS: All quotations expire thirty (30) days from the date of the quotation unless otherwise noted on the quotation. This time limit applies even if Buyer uses the quotation to submit a job or project bid to any other party.

6. ASSIGNMENT: The Buyer's rights and responsibilities under any purchase order or these Terms & Conditions shall not be assigned by Buyer without the express written consent of the Seller.

7. RETURN OF GOODS: Permission to return items must be requested and granted in advance. No credit will be given if items are returned prior to requesting and receiving permission. Subject to the foregoing, Seller shall accept returns of Goods for any reason for a period of thirty (30) days following shipment for exchange or refund of the purchase price; provided, that such Goods must be unused and are subject to a 15% restocking charge, which may be increased or decreased, in the Seller's sole discretion, depending on the reason for such return. Any Goods which were special ordered by Buyer are may not be returned, and any such Goods which are returned are subject to a restocking/cancellation fee of 100% of the cost of the Goods. Goods shall be deemed accepted by Buyer (and cannot thereafter be returned), if Buyer fails to object to the Goods within thirty (30) days after the Goods are received by Buyer.

8. CANCELLATION: The Buyer may cancel any purchase order prior to shipment of the Goods by mutual agreement of the parties and upon payment to Seller of reasonable and proper cancellation charges.

9. TERMINATION: Seller may terminate the whole or any part of any purchase order if there is a material breach of these Terms & Conditions. In the event of any such breach, the Seller will provide Buyer with written notice of the nature of the breach and the Seller's intention to terminate for default. In the event Buyer does not cure such failure within ten (10) days of such notice, Seller may, by written notice, terminate the purchase order; provided, that Buyer shall continue its performance to the extent not terminated.

10. CHANGE IN BUYER'S FINANCIAL CONDITION: Seller reserves the right to cancel any order or to require full or partial payment in advance without liability to Seller in the event of: (i) insolvency of the Buyer; (ii) the filing of voluntary petition in bankruptcy by Buyer; (iii) the appointment of a Receiver or Trustee for the Buyer; (iv) the execution by Buyer of an assignment for benefit of creditors; or (v) past due payment on previous shipments to Buyer by Seller. Seller reserves the right to cancel Buyers credit at any time for any reason.

11. INTERPRETATION RESPONSIBILITY; PRODUCT USE AND SAFETY: Seller does not guarantee that the Goods it sells conform to any plans and specifications or intended use. When plans and specifications are involved, Buyer is solely responsible for verifying Seller's interpretations of such plans and specifications, and it is Buyer's sole responsibility to assure that Seller's Goods will be acceptable for any specific job. When Seller offers substitute Goods on any proposal, Buyer is solely responsible for confirming their acceptability.

12. DELIVERY: Shipping dates given in advance of actual shipment are approximate and not guaranteed. All contract dates and timelines begin upon receipt by Seller of a purchase order, Buyer's acceptance of these Terms & Conditions, and the payment of any required down payment.

13. EXCUSABLE DELAYS: Seller shall have no liability if its performance is delayed or prevented by causes beyond its reasonable control, including, without limitation, acts of nature, labor disputes, government priorities, transportation delays, insolvency or other inability to perform by any Vendor, or any other commercial impracticability. In the event of any such delay, the date of delivery or performance shall be extended for a period equal to the time lost by reason of delay. If Goods are held or stored beyond the delivery date for the convenience of Buyer, such Goods shall be so stored at the risk and expense of Buyer.

14. CLAIMS: Claims for any nonconforming Goods must be made by Buyer, in writing, within ten (10) days of Buyer's receipt of such Goods and must state with particularity all material facts concerning the claim then known to Buyer. Failure by Buyer to give notice within such ten (10) day period shall constitute an unqualified acceptance of such Goods by Buyer, and a waiver of any right to reject or revoke acceptance of such Goods.

15. WARRANTIES:
(a) SELLER'S WARRANTIES: Seller warrants that all Goods sold shall mechanically operate as specified and shall be free from faults in respect to materials and workmanship for a period of: (i) for parts, twelve (12) months from the date of invoice, and (ii) for systems, twelve (12) months from start-up, or, if earlier, eighteen (18) months from the date of the bill of lading. Seller also warrants that the Goods shall, upon payment in full by Buyer for the Goods, be free and clear of any security interests or liens. Buyer's exclusive remedy for breach of such warranties shall be limited to repair or replacement costs or termination of any security interests or liens, and Seller shall have no responsibility for reimbursing repair costs incurred by Buyer in connection with Goods without first giving written authorization for such charges. In any claims by the Buyer against the Seller in respect of the Goods, the liability of the Seller shall be limited to the value of the Goods. This warranty applies only to Goods properly used and maintained and does not apply to any Goods which are misused or neglected, or which has been installed, operated, repaired, altered or modified other than in accordance with instructions or written authorization by Seller. This warranty does not apply to any Goods not manufactured by Seller, and Buyer's sole warranty with respect to such Goods shall be that of the Seller's Vendor, if any.
(b) VENDOR'S WARRANTIES: Seller shall assign to Buyer any Vendor warranties and/or remedies provided to Seller by its Vendor.
(c) INTELLECTUAL PROPERTY INFRINGEMENT: SELLER DISCLAIMS ANY AND ALL WARRANTIES AND/OR INDEMNIFICATIONS AGAINST INFRINGEMENT OF ANY INTELLECTUAL PROPERTY RIGHTS OF ANY NATURE. SELLER SHALL, IF GIVEN PROMPT NOTICE BY BUYER OF ANY CLAIM OF INTELLECTUAL PROPERTY INFRINGEMENT WITH RESPECT TO ANY GOODS SOLD HEREUNDER, REQUEST THE APPLICABLE VENDOR TO GRANT FOR THE BUYER SUCH WARRANTY OR INDEMNITY RIGHTS AS SUCH VENDOR MAY CUSTOMARILY GIVE WITH RESPECT TO SUCH GOODS.
(d) LIMITATIONS: THERE ARE NO OTHER WARRANTIES WRITTEN OR ORAL, EXPRESS, IMPLIED OR BY STATUTE. SELLER SPECIFICALLY DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. NO REPAIR OF GOODS OR OTHER COSTS ARE ASSUMED BY SELLER UNLESS AGREED TO, IN ADVANCE, IN WRITING.
16. LIMITATIONS OF LIABILITY: UNLESS APPLICABLE LAW OTHERWISE REQUIRES, SELLER'S AND ANY VENDOR'S TOTAL LIABILITY TO BUYER, BUYER'S CUSTOMERS OR TO ANY OTHER PERSON, RELATING TO ANY PURCHASES GOVERNED BY THESE TERMS & CONDITIONS, FROM THE USE OF THE GOODS FURNISHED OR FROM ANY ADVICE, INFORMATION OR ASSISTANCE PROVIDED BY SELLER (BY ANY METHOD, INCLUDING A WEB SITE), IS LIMITED TO THE PRICE OF THE GOODS GIVING RISE TO THE CLAIM. NEITHER SELLER NOR ITS VENDORS SHALL BE LIABLE FOR ANY SPECIAL, INCIDENTAL, DIRECT, CONSEQUENTIAL OR PENAL DAMAGES, INCLUDING, BUT NOT LIMITED TO BACKCHARGES, LABOR COSTS, COSTS OF REMOVAL, REPLACEMENT, TESTING OR INSTALLATION, LOSS OF EFFICIENCY, LOSS OF PROFITS OR REVENUES, LOSS OF USE OF THE GOODS OR ANY ASSOCIATED GOODS, DAMAGE TO ASSOCIATED GOODS, LATENESS OR DELAYS IN DELIVERY, UNAVAILABILITY OF GOODS, COST OF CAPITAL, COST OF SUBSTITUTE GOODS, FACILITIES OR SERVICES, DOWNTIME, OR CLAIMS FROM BUYER'S CUSTOMERS OR OTHER PARTIES. IF SELLER FURNISHES BUYER WITH ADVICE OR OTHER ASSISTANCE WHICH CONCERNS ANY GOODS SUPPLIED HEREUNDER, OR ANY SYSTEM OR EQUIPMENT IN WHICH ANY SUCH GOODS MAY BE INSTALLED, AND WHICH IS NOT REQUIRED PURSUANT TO THESE TERMS & CONDITIONS, THE FURNISHING OF SUCH ADVICE OR ASSISTANCE WILL NOT SUBJECT SELLER TO ANY LIABILITY, WHETHER BASED ON CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE) OR OTHER GROUNDS.
17. BUYER'S USE OF GOODS: Many factors beyond Seller's control contribute to the success of the Buyer's finished products, such as raw materials used to manufacture the products. Seller is not liability for the quality or quantity of finished products produced by Buyer with the use of the Goods.
18. EXPORTS: If Goods are sold for export, Seller's standard terms & condition for export sales, if any, shall also apply. Acceptance of export orders is not valid unless confirmed in writing by Seller. Buyer, and not Seller, is responsible for compliance with all United States export control rules and regulations. Buyer shall not name Seller as shipper or exporter of record in connection with the export of any Goods purchased from Seller.
19. INSTALLATION: Installation of the Goods is the responsibility of Buyer, unless otherwise indicated in the quotation or invoice provided to Buyer. Notwithstanding the foregoing, however, Seller will provide installation supervision personnel within thirty (30) days of Buyer's request. If an installation for which the Seller is to participate is delayed by the Buyer more than six (6) months after the date of shipment of the Goods, or if Buyer's facility, materials, or parts are not prepared for installation for such period of time, Seller shall be entitled to invoice the Buyer for the anticipated installation costs, up to $1,250 per day plus expenses, for each of Seller's installations technicians which are on site.
20. ANTI-MONEY LAUNDERING RESTRICTIONS: Seller rejects questionable purchase orders and payments: Except for pre-approved credit arrangements, Seller rejects third-party payments, cashiers' checks, money orders and bank drafts. Seller accepts only checks imprinted with Buyer's name; wire transfers originated in Buyer's account; letters of credit with Buyer as account party; and credit or debit cards in Buyer's name. All payments must be by single instrument in the amount of the invoice, less credits, from banks acceptable to Seller.
21. GOVERNING LAW: These Terms & Conditions and all disputes related to it shall be governed by the laws of the State of Florida, United States of America, without giving effect to its conflict of law rules.
22. JURISDICTION AND VENUE: The parties hereby irrevocably submit to the jurisdiction of the state courts of the State of Florida and to the jurisdiction of the United States District Court for the Middle District of Florida, for the purpose of any suit, action, or other proceeding related to, arising out of or based upon these Terms & Conditions or in any way related to, arising out of or involving sale of Goods hereunder; waive and agree not to assert by way of motion, as a defense, or otherwise, in any such suit, action, or proceeding, any claim that it is not subject personally to the jurisdiction of the above-named courts, that its property is exempt or immune from attachment or execution, that the suit, action, or proceeding is brought in any inconvenient forum, that the venue of the suit, action, or proceeding is improper, or that these Terms & Conditions or the subject matter hereof may not be enforced in or by such court; and waive and agree not to seek any review by any court of any other jurisdiction which may be called upon to grant an enforcement of the judgment of any such Florida state or federal court. The parties hereby consent to service of process by registered mail at the address to which notice is to be given. The exclusive venue for any proceeding under these Terms & Conditions shall be solely in any state court in Pinellas County, Florida, or the Federal District Court for the Middle District of Florida, Tampa Division, sitting in Tampa, Florida. Buyer acknowledges that the prices for Goods offered hereunder are in part dependent on Buyer's consent to jurisdiction in Florida and exclusive venue in Pinellas County, Florida or the Federal District Court for the Middle District of Florida, Tampa Division, sitting in Tampa, Florida, and without Buyer's consent to this jurisdiction and venue provision the prices for the Goods may be higher.
23. GENERAL: Any representation, affirmation of fact and course of dealing, promise or condition in connection therewith or usage of trade not contained herein, shall not be binding on either party. If any provision hereof shall be unenforceable, invalid or void for any reason, such provision shall be automatically voided and shall not be part of these Terms & Conditions and the enforceability or validity of the remaining provisions of these Terms & Conditions shall not be affected thereby.

TO THE EXTENT NOT CONTRARY TO APPLICABLE LAW, THE FOLLOWING SHALL APPLY:
24. Buyer waives any available homestead exemption as well as any and all requirements or rights with regard to notice, demand, presentment.

IMPORTANT NOTICE: *THIS INSTRUMENT PERMITS SELLER TO OBTAIN AND USE YOUR INDIVIDUAL CREDIT HISTORY FOR CREDIT EVALUATION PURPOSES.*

SAFETY & WARNING INFORMATION:

OPERATING YOUR POLYESTER SYSTEM SAFELY

1. Introduction

Any tool, if used improperly, can be dangerous. Safety is ultimately the responsibility of those using the tool. In like manner, safe operation of polyester processes is the responsibility of those who use such processes and those who operate the equipment. This manual outlines procedures to be followed in conducting polyester operations safety. This system has been specifically designed for use of Polyester Resin, Gel-Coat, and Methyl Ethyl Ketone Peroxides (MEKP) applications. Other formulations or blends considered for use in this equipment is strictly prohibited without the expressed consent by Magnum Venus Products Inc. Magnum Venus Products cannot eliminate every danger nor foresee every circumstance that might cause an injury during equipment operation. Some risks, such as the high pressure liquid stream that exits the spray tip, are inherent to the nature of the machine operation and are necessary to the process in order to manufacture the end-product. For this reason, ALL personnel involved in polyester operations should read and understand the Safety Manual. It is very important for the safety of employees involved in the operation that equipment operators, maintenance and supervisory personnel understand the requirements for safe operation. Each user should examine his own operation, develop his own safety program and be assured that his equipment operators follow correct procedures. Magnum Venus Products hopes that this manual is helpful to the user and recommends that the precautions in this manual be included in any such program. Magnum Venus Products recommends this Safety Manual remain on your equipment at all times for your personnel safety. In addition to the manual, Magnum Venus Products recommends that the user consult the regulations established under the Occupational Safety & Health Act (OSHA), particularly the following sections:

1910.94 Pertaining to Ventilation.

1910.106 Pertaining to flammable liquids

1910.107 Pertaining to spray finishing operations, particularly Paragraph (m) Organic Peroxides and Dual Component Coatings.

Other standards and recognized authorities to consult are the National Fire Protection Association (NFPA) bulletins as follows:

NFPA No.33 Chapter 14, Organic Peroxides and Dual Component Materials

NFPA No.63 Dust Explosion Prevention

NFPA No.70 National Electrical Code

NFPA No.77 Static Electricity

NFPA No.91 Blower and Exhaust System

NFPA No.654 Plastics Industry Dust Hazards

Type of Fire Extinguishing equipment recommended: Fire Extinguisher – code ABC, rating number 4a60bc.

Extinguishing Media – Foam, Carbon Dioxide, Dry Chemical, Water Fog.

Copies of the above bulletins are available, at a nominal charge from:

National Fire Protection Association
470 Atlantic Avenue
Boston, MA 02210

Research Report No.11 of the American Insurance Association deal with “Fire, Explosion and Health Hazards of Organic Peroxides”. It is published by:

American Insurance Association
85 John Street
New York, NY 10038

Local codes and authorities also have standards to be followed in the operation of your spraying equipment. Your insurance carrier will be helpful in answering questions that arise in your development of safe procedures.

1.2 Personal Safety Equipment

Magnum Venus Products recommends the following Personal Safety Equipment for conducting safe operations of the Polyester Systems:

Magnum Venus Products recommends that the user consult the state and local regulations established for all Safety equipment listed.

2.0 Material Safety

2.1 Hazards Associated with Laminating Operations

The major hazards which should be guarded against in polyester laminating operations are those associated with:

1. The flammability and explosion dangers of the catalyst normally used – Methyl Ethyl Ketone Peroxide (MEKP).

2. The flammability dangers of clean-up solvents sometimes used (Magnum Venus Products recommends that clean-up solvents be non-flammable), and of resin diluents used, such as styrene.

3. The flammability dangers of catalyst diluents, if used. (Magnum Venus Products recommends that catalyst not be diluted.

4. The flammability dangers of the uncured liquid resins used.

5. The combustibility dangers of the cured laminate, accumulations of over spray, and laminate sandings.

6. The toxicity dangers of all the chemicals used in laminating operations with respect to ingestion, inhalation and skin and eye hazards.

2.2 Catalyst (Methyl Ethyl Ketone Peroxide)

MEKP is among the more hazardous materials found in commercial channels. The safe handling of the “unstable (reactive)” chemicals presents a definite challenge to the plastics industry. The highly reactive property which makes MEKP valuable to the plastics industry in producing the curing reaction of polyester resins also produces the hazards which require great care and caution in its storage, transportation, handling, processing and disposal. MEKP is a single chemical. Various polymeric forms may exist which are more or less hazardous with respect to each other. These differences may arise not only from different molecular structures (all are, nevertheless, called “MEKP”) and from possible trace impurities left from the manufacture of the chemicals, but may also arise by contamination of MEKP with other materials in its storage or use. Even a small amount of contamination with acetone, for instance, may produce an extremely shock-sensitive and explosive compound.

Contamination with promoters or materials containing promoters, such as laminate sandings, or with any readily oxidizing material, such as brass or iron, will cause exothermic “redox” reactions which can become explosive in nature. Heat applied to MEKP, or heat build-up from contamination reactions can cause it to reach what is called its Self-Accelerating Decomposition Temperature (SADT).

Researchers have reported measuring pressure rates-of-rise well in excess of 100,000 psi per second when certain MEKP’s reach their SADT. (For comparison, the highest pressure rate-of-rise listed in NFPA Bulletin NO.68, “Explosion Venting”, is 12,000 psi per second for an explosion of 12% acetylene and air. The maximum value listed for a hydrogen explosion is 10,000 psi per second. Some forms of MEKP, if allowed to reach their SADT, will burst even an open topped container. This suggests that it is not possible to design a relief valve to vent this order of magnitude of pressure rate-of-rise. The user should be aware that any closed container, be it a pressure vessel, surge chamber, or pressure accumulator, could explode under certain conditions. There is no engineering substitute for care by the user in handling organic peroxide catalysts. If, at any time, the pressure relieve valve on top of the catalyst tank should vent, the area should be evacuated at once and the fire department called. The venting could be the first indication of a heat, and therefore, pressure build-up that could eventually lead to an explosion. Moreover, if a catalyst tank is sufficiently full when the pressure relief valve vents, some catalyst may spray out, which could cause eye injury. For this reason, and many others, anyone whose job puts them in an area where this vented spray might go, should always wear full eye protection even when laminating operations are not taking place.

Safety in handling MEKP depends to a great extent on employee education, proper safety instructions and safe use of the chemicals and equipment. Workers should be thoroughly informed of the hazards that may result from improper handling of MEKP, especially in regards to contamination, heat, friction and impact. They should be thoroughly instructed regarding the proper action to be taken in the storage, use and disposal of MEKP and other hazardous materials used in the laminating operation. In addition, users should make every effort to:

A. Store MEKP in a cool, dry place in original containers away from direct sunlight and away from other chemicals.

B. Keep MEKP away from heat, sparks and open flames.

C. Prevent contamination of MEKP with other materials, including polyester over spray and sandings, polymerization accelerators and promoters, brass, aluminum and non-stainless steels.

D. Never add MEKP to anything that is hot, since explosive decomposition may result.

E. Avoid contact with skin, eyes and clothing. Protective equipment should be worn at all times. During clean-up of spilled MEKP, personal safety equipment, gloves and eye protection must be worn. Firefighting equipment should be at hand and ready.

F. Avoid spillage, which can heat up to the point of self-ignition.

G. Repair any leaks discovered in the catalyst system immediately, and clean up the leaked catalyst at once in accordance with the catalyst manufacturer's instructions.

H. Use only original equipment or equivalent parts from Magnum Venus Products in the catalyst system (i.e.: hoses, fitting, etc.) because a dangerous chemical reaction may result between substituted parts and MEKP.

I. Catalyst accumulated from the purging of hoses or the measurement of fluid output deliveries should never be returned to the supply tank, such catalyst should be diluted with copious quantities of clean water and disposed of in accordance with the catalyst manufacturer's instructions.

The extent to which the user is successful in accomplishing these ends and any additional recommendations by the catalyst manufacturer determines largely the safety that will be present in his operation.

2.3 Clean-Up Solvents and Resin Diluents

WARNING

A hazardous situation may be present in your pressurized fluid system! Hydrocarbon Solvents can cause an explosion when used with aluminum or galvanized components in a closed (pressurized) fluid system (pump, heaters, filters, valves, spray guns, tanks, etc.). The explosion could cause serious injury, death and/or substantial property damage. Cleaning agents, coatings, paints, etc. may contain Halogenated Hydrocarbon Solvents. Some Magnum Venus Products spray equipment includes aluminum or galvanized components and will be affected by Halogenated Hydrocarbon Solvents.

A. There are three key elements to the Halogenated Hydrocarbon (HHC) solvent hazard.

a. The presence of HHC solvents. 1,1,1 – Trichloroethane and Methylene Chloride are the most common of these solvents. However, other HHC solvents are suspect if used; either as part of paint or adhesives formulation, or for clean-up flushing. b. Aluminum or Galvanized Parts. Most handling equipment contains these elements. In contact with these metals, HHC solvents could generate a corrosive reaction of a catalytic nature.

b. Equipment capable of withstanding pressure. When HHC solvent contacts aluminum or galvanized parts inside a closed container such as a pump, spray gun, or fluid handling system, the chemical reaction can, over time, result in a build-up of heat and pressure, which can reach explosive proportions.

When all three elements are present, the result can be an extremely violent explosion. The reaction can be sustained with very little aluminum or galvanized metal; any amount of aluminum is too much.

A. The reaction is unpredictable. Prior use of an HHC solvent without incident (corrosion or explosion) does NOT mean that such use is safe. These solvents can be dangerous alone (as a clean-up or flushing agent) or when used as a component or a coating material. There is no known inhibitor that is effective under all circumstances. Furthermore, the mixing of HHC solvents with other materials or solvents, such as MEKP, alcohol, and toluene, may render the inhibitors ineffective.

B. The use of reclaimed solvents is particularly hazardous. Reclaimers may not add any inhibitors. Also, the possible presence of water in reclaimed solvents could feed the reaction.

C. Anodized or other oxide coatings cannot be relied upon to prevent the explosive reaction. Such coatings can be worn, cracked, scratched, or too thin to prevent contact. There is no known way to make oxide coatings or to employ aluminum alloys, which will safely prevent the chemical reaction under all circumstances.

D. Several solvent suppliers have recently begun promoting HHC solvents for use in coating systems. The increasing use of HHC solvents is increasing the risk. Because of their exemption from many State Implementation Plans as Volatile Organic Compounds

(VOC's), their low flammability hazard, and their not being classified as toxic or carcinogenic substances, HHC solvents are very desirable in many respects.

WARNING: **Do not use Halogenated Hydrocarbon solvents in pressurized fluid systems having aluminum or galvanized wetted parts.**

NOTE: **Magnum Venus Products is aware of NO stabilizers available to prevent Halogenated Hydrocarbon solvents from reaction under all conditions with aluminum components in closed fluid system.** ***TAKE IMMEDIATE ACTION…*** **Halogenated Hydrocarbon solvents are dangerous when used with aluminum components in a closed fluid system.**

A. Consult your material supplier to determine whether your solvent or coating contains Halogenated Hydrocarbon Solvents.

B. Magnum Venus Products recommends that you contact your solvent supplier regarding the best non-flammable clean-up solvent with the heat toxicity for your application.

C. If, however, you find it necessary to use flammable solvents, they must be kept in approved, electrically grounded containers.

D. Bulk solvent should be stored in a well-ventilated, separate building, 50 feet away from your main plant.

E. You should allow only enough solvent for one day's use in your laminating area.

F. "NO SMOKING" signs must be posted and observed in all areas of storage or where solvents and other flammable materials are used.

G. Adequate ventilation (as covered in OSHA Section 1910.94 and NFPA No.91) is important wherever solvents are stored or used, to minimize, confine and exhaust the solvent vapors.

H. Solvents should be handled in accordance with OSHA Section 1910.106 and 1910.107.

2.4 Catalyst Diluents

Magnum Venus Products spray-up and gel-coat systems currently produced are designed so that catalyst diluents are not required. Magnum Venus Products, therefore, recommends that diluents not be used. This avoids the possible contamination which could lead to an explosion due to the handling and mixing of MEKP and diluents. In addition, it eliminates any problems from the diluents being contaminated through rust particles in drums, poor quality control on the part of the diluents suppliers, or any other reason. If, however, diluents are absolutely required, contact your catalyst supplier and follow his instructions explicitly. Preferable, the supplier should premix the catalyst to prevent possible “on the job” contamination while mixing.

WARNING

If diluents are not used, it should be remembered that catalyst spillage, gun, hose and packing leaks are potentially more hazardous, since each drop contains a higher concentration of catalyst, and therefore will react quicker with over spray and the leak.

2.5 Cured Laminate, Overspray and Laminate Sandings Accumulation

A. Remove all accumulations of overspray, FRP sandings, etc. from the building as they occur. If this waste is allowed to build up, spillage of catalyst is more likely to start a fire; in addition, the fire would burn hotter and longer.

B. Floor coverings, if used, should be non-combustible.

C. Spilled or leaked catalyst may cause a fire if it comes in contact with an FRP product, over-sprayed chop or resin, FRP sandings or any other material with MEKP.

To prevent this spillage and leakage, you should:

1. Maintain your Magnum Venus Products System. Check the gun several times daily for catalyst and resin packing or valve leaks. REPAIR ALL LEAKS IMMEDIATELY.

2. Never leave the gun hanging over, or lying inside the mold. A catalyst leak in this situation would certainly damage the part, possibly the mold, and may cause a fire.

3. Inspect resin and catalyst hoses daily for wear or stress at the entry and exits of the boom sections and at the hose and fittings. Replace if wear or weakness is evident or suspected.

4. Arrange the hoses and fiberglass roving guides so that the fiberglass strands DO NOT rub against any of the hoses at any point. If allowed to rub, the hose will be cut through, causing a hazardous leakage of material which could increase the danger of fire. Also, the material may spew onto personnel in the area.

2.7 Toxicity of Chemicals

A. Magnum Venus Products recommends that you consult OSHA Sections 1910.94, 1910.106, 1910.107 and NFPA No.33, Chapter 14, and NFPA No.91.

B. Contact your chemical supplier(s) and determine the toxicity of the various chemicals used as well as the best methods to prevent injury, irritation and danger to personnel.

C. Also determine the best methods of first aid treatment for each chemical used in your plant.

2.8 Treatment of Chemical Injuries

Great care should be used in handling the chemicals (resins, catalyst and solvents) used in polyester systems. Such chemicals should be treated as if they hurt your skin and eyes and as if they are poison to your body. For this reason, Magnum Venus Products recommends the use of protective clothing and eye wear in using polyester systems. However, users should be prepared in the event of such an injury. Precautions include:

1. Know precisely what chemicals you are using and obtain information from your chemical supplier on what to do in the event the chemical gets onto your skin or into the eyes, or is swallowed.

2. Keep this information together and easily available so that it may be used by those administering first aid or treating the injured person.

3. Be sure the information from your chemical supplier includes instructions on how to treat any toxic effects the chemicals have.

WARNING

Contact your doctor immediately in the event of any injury and give him the information you have collected. If your information includes first aid instructions, administer first aid immediately while you are contacting your doctor.

Fast treatment of the outer skin and eyes that contact such chemicals generally includes immediate and thorough washing of the exposed skin and immediate and continuous flushing of the eyes with lots of clean water for at least 15 minutes or more. These general instructions of first aid treatment, however, may be incorrect for some chemicals; that is why you must know the chemicals and treatment before an accident occurs. Treatment for swallowing a chemical frequently depends upon the nature of the chemical.

NOTE: **Refer to your System User Manual for complete and detailed operating instructions and service information.**

3.0 Equipment Safety

WARNING

Magnum Venus Products suggests that personal safety equipment such as EYE GOGGLES, GLOVES, EAR PROTECTION, and RESPIRATORS be worn when servicing or operating this equipment. Ear protection should be worn when operating a fiberglass chopper to protect against hearing loss since noise levels can be as high as 116 dB (decibels). This equipment should only be operated or serviced by technically trained personnel!

WARNING

Never place fingers, hands, or any body part near or directly in front of the spray gun fluid tip. The force of the liquid as it exits the spray tip can cause serious injury by shooting liquid through the skin. NEVER LOOK DIRECTLY INTO THE GUN SPRAY TIP OR POINT THE GUN AT OR NEAR ANOTHER PERSON. (TREAT THE GUN AS IF IT WERE A LOADED PISTOL.)

3.1 Emergency Stop Procedures

The following steps should be followed in order to stop the machinery in an emergency situation

1. The ball valve located where the air enters the power head of the resin pump, should be moved to the “OFF” or closed position. To do this, simply rotate the lever on the ball valve 90 degrees. Doing this will cause all the system air to bleed out of the system in a matter of a few seconds, making the system incapable of operating

NOTE: Step 2 is a precautionary step and should be followed whenever the above mentioned ball valve is activated to the stop mode. Failure to do so, can damage the regulators and components on reactivating to the “ON” position.

2. Turn all system regulators to the “OFF” position (counter-clockwise) position

NOTE: Verify that the Catalyst relief line, located on the catalyst manifold, and the resin return line, located on the resin filter, are secured relieving catalyst and resin fluid pressure.

3. Catalyst pressure in the catalyst pump can be eliminated by rotating the ball valve on the catalyst manifold 90 degrees to the “open” or “on” position.

Note: The “open” or “on” position is when the ball valve handle is parallel (in line) with the ball valve body. The “closed” or “off” position is when the ball valve handle is perpendicular (across) the ball valve body.

4. Resin pressure in the resin pump can be eliminated by rotating the ball valve on the resin filter 90 degrees to the “open” or “on” position. Place a container under the ball valve to catch any resin that is ejected out of the valve.

3.2 Grounding

Grounding an object means providing an adequate path for the flow of the electrical charge from the object to the ground. An adequate path is one that permits charge to flow from the object fast enough that it will not accumulate to the extent that a spark can be formed. It is not possible to define exactly what will be an adequate path under all conditions since it depends on many variables. In any event, the grounding means should have the lowest possible electrical resistance. Grounding straps should be installed on all loose conductive objects in the spraying area. This includes material containers and equipment. Magnum Venus Products recommends grounding straps be made of AWG No.18 stranded wire as a minimum and the larger wire be used where possible. NFPA Bulletin No77 states that the electrical resistance of such a leakage path may be as low as 1 meg ohm (10 ohms) but that resistance as high as 10,000 meg ohms will produce an adequate leakage path in some cases. Whenever flammable or combustible liquids are transferred from one container to another, or from one container to the equipment, both containers or container and equipment shall be effectively bonded and grounded to dissipate static electricity. For further information, see **National Fire Protection Association** (NFPA) 77, titled "Recommended Practice on Static Electrical". Refer especially to section 7-7 titled "Spray Application of Flammable and Combustible Materials". Check with local codes and authorities for other specific standards that might apply to your application. NEVER USE HARD MATERIALS SUCH AS WIRE, PINS, ETC., TO CLEAR A PLUGGED GUN. HARD MATERIALS CAN CAUSE PERMANENT DAMAGE. DAB WITH A BRISTLE BRUSH, BLOW BACKWARDS WITH AIR UNTIL CLEAR WHILE WEARING A PROTECTIVE EYE SHIELD. REPEAT AS MANY TIMES AS NECESSARY. DO NOT PERFORM ANY MAINTENANCE OR REPAIRS UNTIL YOU HAVE FOLLOWED THE PRECAUTIONS STATED ABOVE. IF YOU, AS AN EQUIPMENT OPERATOR OR SUPERVISOR, DO NOT FEEL THAT YOU HAVE BEEN ADEQUATELY TRAINED OR INSTRUCTED AND THAT YOU LACK THE TECHNICAL KNOWLEDGE TO OPERATE OR PERFORM MAINTENANCE ON A PIECE OF MAGNUM VENUS PRODUCTS EQUIPMENT, PLEASE CALL MAGNUM VENUS PRODUCTS BEFORE OPERATING OR PERFORMING MAINTENANCE ON THE EQUIPMENT. IF YOU HAVE ANY QUESTIONS REGARDING THE ABOVE PRECAUTIONS OR ANY SERVICE OR OPERATION PRECEDURES, CALL YOUR MAGNUM VENUS PRODUCTS DISTRIBUTOR OR MAGNUM VENUS PRODUCTS.

NOTICE: All statements, information and data given herein are believed to be accurate and reliable but are presented without guaranty, warranty or responsibility of any kind express or implied. The user should not assume that all safety measures are indicated or that other measures are not required.

DANGER: Contaminated catalyst may cause Fire or Explosion. Before working on the catalyst pump or catalyst accumulator, wash hands and tools thoroughly. Be sure work area is free of dirt, grease or resin. Clean catalyst system components with clean water only.

DANGER: Eye, skin and respiration hazard. The Catalyst, MEKP, may cause blindness, skin irritation or breathing difficulty. Keep hands away from face. Keep food and drink away from work area.

WARNING: Please refer to your catalyst manufacturer's safety information regarding the safe handling and storage of catalyst. Wear appropriate safety equipment as recommended.

Introduction:

This manual, the ***VLS-4600 FLUID SECTION MANUAL***, provides information you need to perform simple maintenance and repair on your equipment.

- ❑ Step-by-step assembly and disassembly procedures are included for each component.
- ❑ A troubleshooting guide helps you diagnose and perform common repair situations.
- ❑ A comprehensive maintenance schedule provides a detailed list for performing daily, weekly, monthly, three-month and annual maintenance.

Please read the manual carefully. Follow the steps in the order given, otherwise you may damage the equipment or injure yourself.

DANGER: Always wear proper safety equipment, including eye protection and gloves when performing service and repair on this equipment.

This manual covers the following pump assemblies:

VLS-4600	Fluid Section Assembly
VLS-4600-HD	Fluid Section Assembly – Heavy Duty
VLS-4600-HD-SS	Fluid Section Assembly – Heavy Duty – Stainless Steel
VLS-4600-MP	Fluid Section Assembly – Magnapak
VLS-4600-SS	Fluid Section Assembly – Stainless Steel
DLS-4600	Fluid Section Assembly – Duo Unit
DLS-4600-SS	Fluid Section Assembly – Duo Unit – Stainless Steel
MCPA-4600	Fluid Section Assembly – Multi Color units
UPLS-4600	Fluid Section Assembly – Universal Proportioner
UPLS-4600-SS	Fluid Section Assembly – Universal Proportioner – Stainless Steel
VLS-4640-CK	Fluid Section Conversion Kit - Magnapak

During Disassembly:

As you disassemble the equipment, lay out the components in the correct order and direction. This will help you to reassemble them.

Note: the order of the piston cup, piston cup spacer ring, piston cup backup ring and compression ring and the directions they face. These directions are critical to proper functioning of this equipment.

Lubrication:

Throughout this manual, directions are given for lubricating various parts of the Fluid Section. These are the typical lubricants used:

- If the part contacts resin, use MVP Red Grease (6706-2-1).
- If the part is located where it will contact air, use Lubriplate® (08465).
- Throat Seal Oil (TSL-3200) used in the oil reservoir of the pump.
- Grease for use with ISO (GR-ISO-100) 1 oz.
- Throat Seal Oil for use with ISO (TSL-ISO-800) 8 oz.

DANGER: FIRE AND EXPLOSION HAZARD. Never use any lubrication on the components of the catalyst system. Contact your catalyst manufacturer for additional material handing information.

Major Components:

- Resin Pump Fluid section.

Description of Controls for Spray unit:

Familiarize yourself with the manifold controls, which consist of the following regulators and gauges:

- PUMP PRESSURE gauge and regulator. These control main air pressure to the resin pump.
- ATOMIZING-AIR gauge and regulator. This controls the air pressure to the catalyst nozzle on the gun.
- PRIMING BUTTON this control is to operate the pump with triggering the gun.

Hazard Information:

Please note the following safety and informational designations used throughout this manual:

DANGER: Indicates hazards or unsafe practices that are likely to result in severe personal injury or death.

WARNING: Indicates hazards or unsafe practices which could result in severe personal injury or extensive equipment damage.

CAUTION: Indicates hazards or unsafe practices which could result in minor injury or damage to equipment.

NOTE: Indicates additional information including explanations of certain procedures or helpful suggestions. Notes do not contain safety information.

Requirements:

Air Requirements:

Clean, dry compressed air must be available at up to 90 psi (6.3 kg/cm^2) and a minimum volume of 10 CFM (0.3 m^3). Air must be provided through an air hose with a diameter of 0.5 inch (1.3 cm) or greater.

Tool and Supplies Requirements:

When performing service and repair on the Fluid Section, you should have the following tools, spare parts and supplies available before beginning.

NOTE: Items followed by a * may be purchased from Magnum Venus Products.

- ❑ One table vise
- ❑ Loctite™ 243 (removable) or equivalent thread lock compound
- ❑ One small hammer
- ❑ Needle-nose pliers
- ❑ Solvent or emulsifier for cleaning
- ❑ One clean work table
- ❑ Anti-seize thread sealant
- ❑ Set of hex wrenches * (08469)
- ❑ One 5/8-inch wrench * (08474)
- ❑ One 9/16-inch wrench * (08476)
- ❑ One 5/16-inch wrench * (08477)
- ❑ Empty buckets for cleaning
- ❑ Clean ¼-inch plastic dowel or rod
- ❑ One 8-inch adjustable wrench * (08467)
- ❑ One 12-inch adjustable wrench * (08468)
- ❑ One 7/16-inch open-end wrench
- ❑ One ½-inch socket wrench
- ❑ One 7/16-inch socket wrench * (08472)
- ❑ Wooden sticks or tongue depressors (for testing)
- ❑ Labels and pens (for marking pneumatic lines)
- ❑ Clean rags and paint brushes for cleaning equipment
- ❑ One tube of medium-weight lithium grease (such as Lubriplate® lubricant * (08465))
- ❑ Large (approximately 3 feet by 10 feet or 1 meter by 3 meters) strips of paper for performing spray tests.
- ❑ One pin wrench * (45031-1) (comes with catalyst jug)
- ❑ One scribe * (08126)
- ❑ Red Grease * (6706-2-1 1oz can) (6706-2-16 16oz can) (6706-2-32 32oz can)

- ❑ Seal Kits *
  - DLS-4600-SS-RK Repair Kit – Stainless Steel Duo Units
  - VLS- 46RK-4T-2T-SS Repair Kit – Stainless Steel fluid sections
  - VLS-46-RK-4T-2T Repair Kit – Standard fluid sections
  - VLS-46RK-MP Repair Kit – Magnapak fluid sections
  - UPLS-46SK-4T-2G Seal Kit – Standard fluid section
  - UPLS-46SK-4T-1GB Seal Kit – with optional Piston Seal

NOTE: Lubriplate® is a registered trademark of the Lubriplate division of Fiske Brothers Refining Company.

NOTE: Loctite™ is a trademark of the Loctite Corporation.

NOTE: Teflon® is a registered trademark of E.I. DuPont de Nemours and Co.

IMPORTANT WARRANTY INFORMATION

Please note that components used on this equipment are made of specially developed, high-strength material.

- ❑ Only authentic Magnum Venus Plastech replacement parts are acceptable for use with this equipment.
- ❑ Use of unacceptable replacement parts will void our liability and warranty of this equipment.

Please contact your Magnum Venus Products distributor for more information.

Installation & Set-up:

1. Check all clamp brackets, pump column, slave arm bracket, manifold clamp, etc. to make sure they will not move when unit is in operation.

2. Check the mounting of catalyst pump to make sure clevis pins are secure.

3. Make sure exhaust silencer is secured to the power cylinder of the resin pump.

IMPORTANT: Snug up the packing nut at the top of the catalyst pump approximately ¼ turn.

4. Snug up, tighten, the resin pump packing by inserting two rods into the holes in the oil cup at the top of the resin pump fluid section. Turn clockwise until packing is snug. ***Note: Do not over tighten.***

5. **Pro Gun:** Tighten the gun valve rod packing nuts until they are very snug. **IMPORTANT: Activate the gun trigger 10 - 15 times then tighten the packing nuts.** Repeat this tightening procedure 3 times to make sure the gun valve rod packing is tight.

6. Attach Suction Wand to Resin Pump.

   a. Check all fittings on the wand assembly to make sure they are airtight.

   b. Attach the wand assembly to the foot valve port of the resin pump.

7. Hose connections.

   a. Connect the black resin hose from the gun to the outlet fitting on the resin filter.

   b. Connect the catalyst hose from the catalyst pump to the inlet of the catalyst manifold.

   c. Connect the catalyst hose from the gun to the outlet of the catalyst manifold assembly.

   d. Attach the red air hose from the gun to the fitting on the regulator labeled gun.

   e. Attach the yellow poly flush hose from the gun to the outlet fitting of the solvent tank.

   f. Attach the small red air supply hose from the flush regulator to the input fitting on the solvent tank.

   g. Attach the large red air hose from the pump regulator to the power cylinder of the resin pump.

Note: Check all hose fittings and fluid connections to make sure they are tight.

   h. Attach the ground wire from the gun to the electrical grounding lug on the pump mounting bracket.

Note: Check electrical ground to ensure it is installed from the pump mounting bracket to an earth ground.

   i. Remove the catalyst poly tubes from the component box.

   j. Cut the ½ inch diameter poly line, with the clamps, to 26 inches long. Clamp one end to the outlet of the catalyst jug and the other end to the inlet of the catalyst pump. Make sure clamps are airtight.

   k. Connect the ¼-inch poly line to the relief valve on the catalyst manifold assembly and insert the other end into the hole in the top of the catalyst jug.

   l. Connect the ¼-inch poly line to the catalyst recirculation valve on the catalyst manifold, and insert the other end into the hole in the top of the catalyst jug.

9. Check all components for damage.

Maintenance:

DANGER: Contaminated catalyst may cause FIRE or EXPLOSION. Before working on the catalyst pump or catalyst accumulator, wash hands and tools thoroughly. Be sure work area is free of dirt, grease or resin. Clean catalyst system components with clean water only.

DANGER: FLUIDS UNDER HIGH PRESSURE. Before performing any service and repair on this equipment, be sure to relieve air and fluid pressure.

DANGER: Always wear appropriate eye protection when working with this equipment.

WARNING: When removing hoses, place a rag over the hose before loosening it.

Performing proper maintenance at the recommended time intervals maximizes your equipment's productivity and efficiency. This section describes recommended maintenance procedures to be performed daily, weekly, monthly, every three months, twice per year and once per year.

Please follow the maintenance schedules recommended in this manual. This schedule is based on a one-shift, 5-day work week, using standard general purpose resin. An idle unit left with resin in it requires more frequent parts replacement.

DAILY MAINTENANCE CHECKLIST:

PART	PROCEDURE
Air Filter ("Water Trap")	Drain the air filter by holding a container under the filter and turning the valve at the bottom.
Hoses	Check for kinks or leaks.
Fluid Section	Check the oil reservoir and add oil if needed.
Nozzle Cap	Coat nozzle cap and threads with Red Grease.
Materials	Check and fill catalyst jug and gel coat / resin. Never run out

WEEKLY MAINTENANCE CHECKLIST:

PART	PROCEDURE
Air Filter ("Water Trap")	Drain
Hoses	Check for kinks or leaks.
Gauges and Regulators	Check for damage and proper operation.
Accumulator	Remove and clean inside. ***Danger: Never attempt to remove an accumulator until you have relieved pressure.*** See Chapter 6: Accumulator & Filter.
Filter	Clean and inspect filter screen for plugging. ***Note: Clean the screen weekly and when changing from one material to another. Use proper screen mesh size according to the material being used.***
Fluid Section	Check the oil reservoir and add oil if needed. If necessary, clean and dry the silencers. Check the pickup hose and wand for leaks and damage. Check for packing leaks.
Air Lines	Check for leaks, wear and kinks. Replace if necessary.

MONTHLY MAINTENANCE CHECKLIST:

PART	PROCEDURE
Air Filter ("Water Trap")	Drain.
Hoses	Check for kinks or leaks.
Gauges and Regulators	Check for damage and proper operation.
Accumulator	Remove and clean inside. ***Danger: Never attempt to remove an accumulator until you have relieved pressure.*** See Chapter 6: Accumulator & Filter.
Filter	Clean and inspect filter screen for plugging. ***Note: Clean the screen weekly and when changing from one material to another. Use proper screen mesh size according to the material being used.***
Fluid Section	Check the oil reservoir and add oil if needed. If necessary, clean and dry the silencers. Check the pickup hose and wand for leaks and damage. Check for packing leaks.
Catalyst Jug	Check and clean tubes and filter screens if necessary. ***Danger: Fire and explosion hazard. Never allow solvent or grease to contact any part of the catalyst system.***
Air Lines	Check for leaks, wear and kinks. Replace if necessary.

SIX MONTH MAINTENANCE CHECKLIST:

PART	PROCEDURE
Air Filter (“Water Trap”)	Drain.
Hoses	Check for kinks or leaks.
Gauges and Regulators	Check for damage and proper operation.
Accumulator	Remove and clean inside. Replace the O-Rings. ***Danger: Never attempt to remove an accumulator until you have relieved pressure.*** See Chapter 6: Accumulator & Filter.
Filter	Clean and inspect filter screen for plugging. ***Note: Clean the screen weekly and when changing from one material to another. Use proper screen mesh size according to the material being used.***
Fluid Section	Replace the oil in the oil reservoir. If necessary, clean and dry the silencers. Check piston rod, cylinder head, piston and trip sleeve for wear and damage, replace as needed. Replace O-Rings, cups, and packing set. Check the pickup hose and wand for leaks and damage. Check for packing leaks. Check piston rod and pump cylinder for wear, replace as needed. Replace the packing set, piston cups and O-Rings.
Catalyst Jug	Check and clean tubes and filter screens if necessary. ***Danger: Fire and explosion hazard. Never allow solvent or grease to contact any part of the catalyst system.***
Air Lines	Check for leaks, wear and kinks. Replace if necessary.
Catalyst Pump	Replace all soft parts of the catalyst pump. Be sure to: check bushings and pump cylinder and replace S.S. balls, O-Rings, springs, piston seal and packing set.

ANNUAL MAINTENANCE CHECKLIST:

PART	PROCEDURE
Air Filter ("Water Trap")	Drain. Repair any leaks or damage.
Gauges and Regulators	Check for damage and proper operation.
Accumulator	Remove and clean inside. Replace the O-Rings. ***Danger: Never attempt to remove an accumulator until you have relieved pressure.*** See Chapter 6: Accumulator & Filter.
Filter	Clean and inspect filter screen for plugging. ***Note: Clean the screen weekly and when changing from one material to another. Use proper screen mesh size according to the material being used.***
Fluid Section	Replace the oil in the oil reservoir. Clean and dry the silencers. Check piston rod, trip sleeve, cylinder head and piston for wear or damage, replace as required. Replace the O-Rings, piston cups and packing set. Rebuild lower assembly.

Disassembly of Fluid Section:

NOTE: Flushing the pump fluid section with solvent will make it easier to clean and rebuild.

CAUTION: There are two (2) hard chrome balls in the Fluid Section assembly. If a ball drops to the floor, it will be damaged. (Even if it appears undamaged, it will contain dents and scratches that will create problems.) Damaged balls must be replaced or the pump will not work properly.

NOTE: When disassembling the Fluid Section, replace any O-Rings that you expose.

Maintenance:

1. For a complete maintenance schedule, please refer to Chapter 3: Maintenance.

Troubleshooting:

1. For a complete troubleshooting schedule, please refer to Chapter 7: Troubleshooting Chart.

Parts Drawings:

1. To perform service and repair on the Fluid Section, please follow the procedures below. Please refer to a current parts drawing for the Fluid Section you are working on for part numbers.

Turn Off Pressure:

1. Be sure all fluid pressure and air pressure is relieved from the system before performing any work.

DANGER: To avoid serious injury or equipment damage, do not proceed unless the system has been completely depressurized.

Remove Catalyst Pump:

1. Be sure the catalyst pump has been removed from the catalyst drive.

Note: some of the part numbers below will be different depending on which fluid section you are working on – refer to a current parts drawing for the assembly you are working on.

To remove the Fluid Section from the Unit:

1. Remove the E-Ring, lift up the Sleeve and remove the two Connectors.

2. Remove the Quick Pin and slide the Rail Assembly out of the Piston Rod Adapter.

Fluid Section Disassembly Procedures:

1. Remove the two Hex Nuts (F-HN-08C) from the Pump Cylinder Tie Rods (VLS-4623).

2. Slide the Foot Valve Collar, Foot Valve and Cylinder down off the Piston Rod; discard the two O-Rings. Remove the Ball Stop (VLS-4620) and Foot Valve Spring (VLS-4621).

3. Remove and discard the 1-1/4" Chrome Ball. Clean and inspect ball seat area of Foot Valve.

4. Loosen Packing Nut (VLS-4607) and slide the Piston Rod out the bottom of the Outlet Body.

5. Unscrew the Piston Nut from the Piston Body. Remove the two Piston Cups, Piston Cup Back-up and Piston Cup Spacer from the Piston Body. Discard the two Piston Cups.

6. Unscrew the Piston Body from the Piston Rod. Remove the 7/8" Ball and the Piston Ball Spring (VLS-4614) Discard the 7/8" Ball.

Note: Only discard the 7/8" Ball if the Repair / Seal Kit has a replacement.

7. Remove the Packing Nut (VLS-4607) from the Outlet Body. Use a 1/4" wooden dowel to push the Packing Set Assembly (VLS-4605) out the top of the Outlet Body. Discard the packing set. Clean and inspect the Guide Bearing (VLS-4603), Female Compression Ring, Male Compression Ring, Wave Spring (VLS-4610), and Spring Support Ring (VLS-4611).

8. Clean and inspect all parts that will be reused, replace as needed.

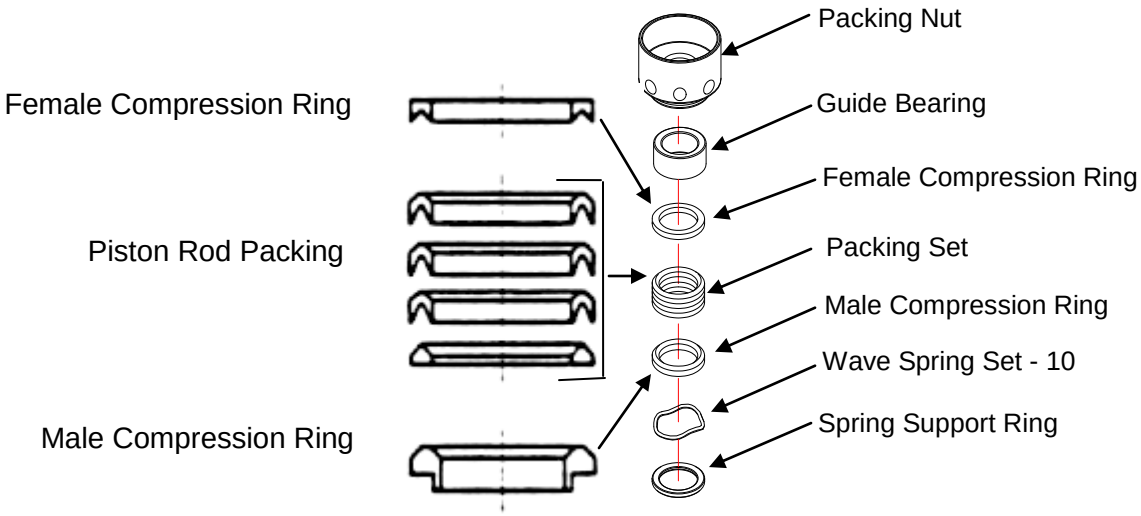
Assembly of Fluid Section:

Note: some of the part numbers below will be different depending on which fluid section you are working on – refer to a current parts drawing for the assembly you are working on.

Note: The MVP Red Grease is not compatible with some materials and should not be used in the Fluid sections that process those materials.

Note: It is important to use the correct grease and lubrication for the material that will be used in the pump – use ISO grease and lubrication for pumps that pump ISO material.

1. Use MVP Red Grease (6706-2-1) or other appropriate grease to fill in the female side of each of the four Packing in the Packing Set Assembly (VLS-4605) and the Female Compression Ring (VLS-4604). Wipe a light coat of Red Grease on the 7/8" Ball, and the 1-1/4" Ball. Smear Red Grease on the inner radius on both Piston Cups (VLS-4615). Coat the threads on the Packing Nut (VLS-4607) with the Red Grease.

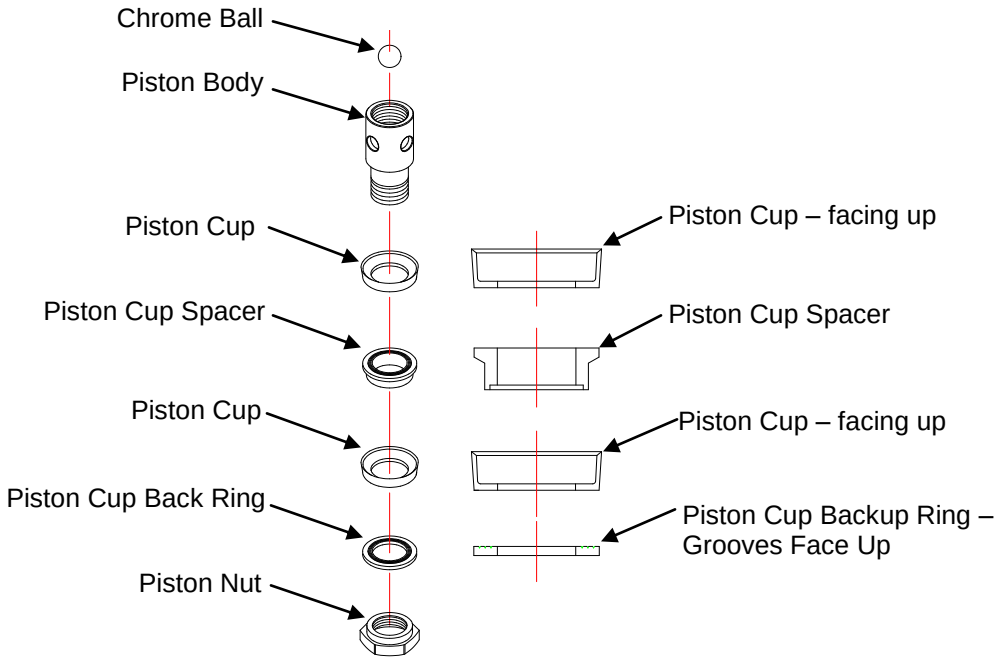


2. Insert the Spring Support Ring (VLS-4611) into the Outlet Body, followed by the ten Wave Springs (VLS-4610). Place the Packing set Assembly (VLS-4605) on top of the Male Compression Ring. Set the Female Compression Ring on top of the Packing Set Assembly (VLS-4605).

3. Place the entire assembly into the Outlet Body with the female side of the Packing Set facing down. Set the Guide Bearing (VLS-4603) into the Outlet Body. Screw the Packing Nut (VLS-4607) into the Outlet Body only two to three threads.

NOTE: Do not tighten the Packing Nut (VLS-4607) at this time.

4. Slide one Piston Cups onto the Piston Body with the open side of the Piston Cup facing up. Slide the Piston Cup Spacer with grooved side up against the Piston Cup. Install the second Piston Cup up against the Piston Cup Spacer with the open side up. Slide the Piston Cup Back-Up with grooves facing up against the Piston Cup. Coat the threads of the Piston Nut with Red Grease, and screw it onto the Piston Body.



Note: The UPLS-4600-SS Fluid Section has a Soft Seat / O-ring (O-K-116) that will be installed into the Piston Body before the 7/8" Ball (reference drawing).

5. Place 7/8" Ball into the Piston Body. Set the Piston Ball Spring (VLS- 4614) into the Piston Body with the small end of the spring against the 7/8" Ball.

NOTE: Do not drop, dent, or scratch the 7/8" Ball or 1-1/4" Ball.

6. Coat the threads of the Piston Body, and screw it onto the Piston Rod. Tighten the Piston Nut and the Piston Body wrench tight.

7. Slide the Piston Rod up through the Outlet Body and tighten the Packing Nut (VLS-4607) enough to hold the Piston Rod in place.

Note: The UPLS-4600-SS Fluid Section has a Soft Seat / O-ring (O-K-122) that will be installed into the Foot Valve before the 1-1/4" Ball (reference drawing).

8. Install 1-1/4" Ball, then the Foot Valve Ball Spring (VLS-4621) into the Foot Valve. Compress the Ball Stop (VLS-4620) and insert it into the Foot Valve groove. Position one end of the Cylinder into the Foot Valve. Slide O-Rings on cylinder and lubricate with Red Grease.

9. Use lithium grease on the Pump Cylinder Tie Rod (VLS-4623) threads and screw into Outlet Body if they were removed.

NOTE: The two Pump Cylinder Tie Rods (VLS-4623) must be inserted in opposing holes. The UPLS versions of the fluid sections have four Tie Rods (VLS-4623).

10. Slide the Cylinder with Foot Valve over the Piston Rod Assembly and start the Hex Nuts (F-HN-08C) onto the Pump Cylinder Tie Rods (VLS-4623). Tighten uniformly until wrench tight.

11. Use a 1/4" metal rod, or Phillips screwdriver to tighten the Packing Nut (VLS-4607).

Note: Do not over tighten the Packing Nut as it can bind on the Piston Rod – only tighten ¼ - ½ turn past hand tight – enough to prevent the Packing from leaking. Tight ¼ - ½ turn as needed weekly to prevent material for leaking into the Packing Nut.

Note: There is no adjustment for the Packing Nut on Magnapak version of the fluid sections – the packing nut is snug against the outlet body.

Options Packing & Packing Sets:

VLS-4605-2U2G	PACKING SET
VLS-4605-GFT	PACKING SET – GLASS FILLED
VLS-4605-U	PACKING SET – UHMW
VLS-4640	CUP SEAL – MAGNAPAK

Optional Piston Cups / Cup Seals:

VLS-4633	Piston Cup Seal – Single piece – UHMW
VLS-4633-GFT	Resin Piston Seal – Single piece – Glass Filled Teflon

Magnapak Fluid Sections:

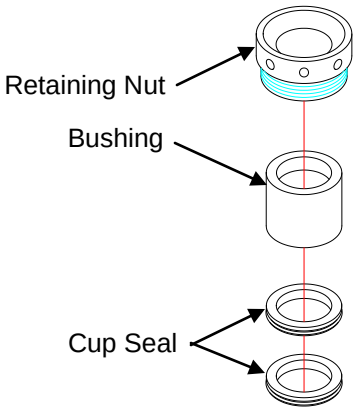
The Magnapak fluid sections replace the packing set and piston cups with a different setup. Most of the procedures will be the same as above procedure except as shown below.

1. Lightly grease the Cup Seals (VLS-4640) with Red Grease (6706-2-1).

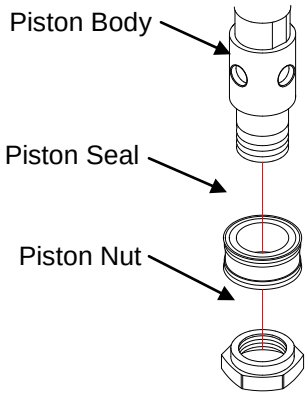
2. Install the two Cup Seals (VLS-4640) into the top of the Outlet Body.

3. Pack the Bushing (VLS-4632) with Red Grease (6706-2-1) and install into the Outlet Body on top of the Cup Seals.

4. Lightly grease the threads of the Retaining Nut (VLS-4631) and thread into the top of the Outlet Body snug.



5. Install the Piston Seal (VLS-4633) on to the Piston Body and thread on the Piston Nut.



Note: use Patriot Oil (PAT-LS-OIL) in the Packing nut for the Magnapak Cup Seal set (TLS-ISO-800 if appropriate).

- ***PAT-LS-OIL*** ***8 ounces***
- ***PAT-LS-OIL-1GL*** ***1 Gallon***
- ***PAT-LS-OIL-5GL*** ***5 Gallons***

To Reinstall onto Unit:

Note: the following instruction will vary depending on the Fluid Section you are working on.

1. Position the Sleeve over the Power Cylinder Piston Shaft. Bring the Power Cylinder Piston Shaft down onto the top of the Piston Rod Adapter. Insert the two Connectors and lower the Sleeve. Install the Ring in machined groove.

2. Slide the Rail Assembly around the Piston Rod Adapter and insert the Quick Pin.

3. Fill the packing nut cavity 1/2 to 2/3 full with TSL (Throat Seal Oil).
    - TSL-800 1/2 PINT
    - TSL-3200 1 QUART
    - TSL-1280 1 GALLON

      or
    - PAT-LS-OIL 8 ounces
    - PAT-LS-OIL-1GL 1 Gallon
    - PAT-LS-OIL-5GL 5 Gallons

      or
    - TSL-ISO-800 8 ounces

Set The Packing Set:

1. Prime the Fluid Section with fluid.

2. Close the gun-head.

3. SLOWLY increase the pump pressure to 60 - 80 psi. It will be necessary to push and hold the priming button if one is installed on this unit.

4. Keep the pump stalled for 5 to 15 minutes to allow the packing set to set.

5. Perform the above procedures for both the up and down strokes.

Note: If the pump is slowly moving while it should be stalled it indicates that the there is a leak past the ball or seals (up stroke)

6. Decrease the pump pressure to the desired operating pressure. Now you are ready to connect, prime and pressurize the catalyst pump for operation.

Accumulator & Filter:

Maintenance:

The accumulator & filter should be disassembled and cleaned approximately once per week (more often if the weather is hot).

Troubleshooting:

If you must keep increasing pressure to maintain an adequate spray fan, the filter may be clogged with debris. If the spray is pulsing, the accumulator is probably blocked. When dealing with system blockages, follow the safety instructions below.

DANGER: Before disassembling accumulator, relieve fluid pressure and air pressure. If material is plugging the system, some parts of the system may still contain fluids under high pressure, even after you have followed normal procedures to relieve the pressure.

WARNING: To prevent injury, hold a large rag or shop towel around the wrench and fitting as you remove the fitting. Remove the fitting slowly to allow fluid pressure to escape into the rag or towel.

WARNING: Always wear appropriate eye protection and other protective clothing when performing service and repair on the accumulator & filter.

Parts Drawings:

To service the accumulator, please follow the procedures below, using drawing FF-5000-XX Accumulator & Filter Assembly.

Relieve Air and Pump Pressure:

1. Turn pump pressure off.
2. Hold the gun over an appropriate empty container and lock the gun in an open position.
3. Disconnect air from the system.
4. Place an empty container under the filter/accumulator; slowly open the ball valve at the bottom of the filter cap.

DANGER: Never attempt to remove, repair or clean an accumulator until you have relieved pressure.

Remove and Disassemble Filter:

1. Unscrew the filter cap (FF-5002) from the filter body (FF-5001).

NOTE: The components of the resin accumulator and filter should not be over tightened.

2. Remove the screen from the filter body (FF-5001).

3. Inspect the screen and clean with solvent.

NOTE: Typically, the screen is a 100-mesh. Mesh size depends on the resin type and the size of the nozzle tip used on the gun. If you change resin types, you may want to experiment with a different nozzle tip and/or a different size mesh in your filter screen.

4. Inspect the interior of the filter body and clean with solvent.

5. Check the O-Ring (O-V-022) on the filter cap for wear or damage. Replace if necessary.

NOTE: If resin is leaking down the side of the filter cap, the O-Ring (O-V-022) is worn and should be replaced.

Assemble and Install Filter Body:

1. Lubricate the threads of the filter cap (FF-5002) and o-ring (O-V-022) with red grease (6706-2-1).

2. Place the screen (FF-5099-100) onto the filter cap (FF-5002).

3. Screw the filter cap into the filter body (FF-5001).

Remove Accumulator Bottle:

DANGER: Before disassembling accumulator, relieve fluid pressure and air pressure. If material is plugging the system, some parts of the system may still contain fluids under high pressure, even after you have followed normal procedures to relieve the pressure.

1. Unscrew the surge chamber from the nipple

2. Inspect the interior of the accumulator bottle. Clean with solvent and blow dry with air if needed.

Install Accumulator Bottle:

1. Screw the nipple and surge chamber into the top of the filter body (FF-5001).

2. Check for leaks

Troubleshooting Chart:

DIAGNOSING PROBLEMS:

The most common problems with the equipment are diagnosed by analyzing the cured part.

NOTE: Many problems are the direct result of a failure to maintain the equipment according to the maintenance schedules given. Please follow your maintenance chart.

PROBLEM	CAUSE	SOLUTION
Slow cure during upstroke	S.S. Ball in catalyst pump piston body not seating	Clean ball and inspect seat. Replace ball, piston seal or piston body if questionable.
Slow cure during down stroke	S.S. Ball in catalyst pump inlet body not seating.	Clean ball and inspect seat. Replace ball or have seat repaired if questionable.
	Catalyst Check Valve (CV-2000) not working correctly.	Check and Repair the Catalyst Check Valve (CV-2000).
No cure or slow over-all cure	Catalyst pump set at too low or too high of a percentage.	Move catalyst pump to a higher setting (closer to the gel coat pump). Be sure to attach the catalyst pump in a vertical position.
	Catalyst supply below outlet fitting on jug.	Fill catalyst jug 1/3 full.
	Catalyst drive not engaged or connected	Install quick pin. Be sure to attach the catalyst pump vertically.
	Catalyst leak.	Check all fittings. The catalyst system must be fluid tight.
	Catalyst relief valve on catalyst pump is leaking.	Relieve pressure from pump. Clean and repair the Relief Valve
	Catalyst suction screen in catalyst jug clogged.	Clean catalyst suction screen and ensure that catalyst supply is not contaminated.
	Air lock in catalyst pump.	Remove air lock. See Appendix: Air Lock in the Catalyst Pump.
	Catalyst pump piston seal worn or damaged	Replace piston seal. During reassembly, be sure spring in seal faces top of pump
PROBLEM	**CAUSE**	**SOLUTION**
	Catalyst pump outlet body damaged.	Replace catalyst pump outlet body and piston seal. During reassembly, be sure spring in seal

		faces top of pump. Prevent by connecting catalyst pump vertically.
	Catalyst pump check valve blocked or stuck.	Disassemble check valve and remove blockage.
	Catalyst hose plugged. ***Danger: In the next steps you will be dealing with fluids under high pressure. Follow safety instructions read the Safety & Warning section in the beginning of this manual.***	Relieve pressure from the system. Replace the catalyst hose with new one.
	Resin or gel coat too cold.	Consult your materials supplier for proper temperature. Maintain a draft-free environment of about 70 degrees F. An auxiliary heat source may be required to reduce gel time.
	Piston cups, piston ball, or pump cylinder worn.	Inspect the piston cups, piston ball, and pump cylinder. Clean and replace any damaged components.
	Screen of pump pick-up wand blocked.	Unscrew screen from hose and clean.
Low output on upstroke of pump		
No fan, constant low output, or fast cure	Gun Block plugged or seal rotated	Repair or replace the gun block – remove blockage.
	Resin hose plugged. ***Danger: To prevent injury, always relieve fluid pressure before attempting to remove components.***	Flush hose with solvent. If material is hard, replace hose.
	Pick-up wand assembly leaking.	Tighten assembly fittings.
	Resin filter clogged.	Disassemble and clean the resin filter. See Chapter 7: Accumulator & Filter.
	Material too cold or air pressure low.	Heat material or increase pump pressure

PROBLEM	CAUSE	SOLUTION
Narrow Fan **Wide Fan**	Material too cold, nozzle too large or air pressure low.	Heat Material, use smaller nozzle, or as a last resort increase pump pressure.
	Resin filter clogged.	Disassemble and clean the resin filter.
	Air pressure too high.	Lower pressure then increase pressure to the desired fan.
	Nozzle too small or too wide.	Change nozzle.
Round fan	Orifice in nozzle worn, clogged, or damaged.	Push fine wire through orifice from back side. Use fingernail to clean material form "V" shaped notch in front. Soak hardened material in solvent. If notch is rough or worn, replace nozzle.
	Air-assist pressure too high.	Decrease air-assist pressure.
Excessive Misting **Heavy pulsation**	Air pressure too high.	Reduce air pressure to gel coat pump.
	Resin accumulator plugged. ***Danger: To prevent injury, always relieve fluid pressure before attempting to remove components.***	Disassemble accumulator and clean.
Pump jumps on upstroke	Piston ball worn or not seating properly.	Replace piston ball and piston cups. Be sure to lubricate ball and cups thoroughly with Red Grease.
Pump dives on down stroke	Foot valve, spring retainer, or foot valve ball damaged or dirty.	Clean or replace foot valve, spring retainer and foot valve ball. Be sure to lubricate ball thoroughly with Red Grease.
	Pick-up wand assembly not tight.	Tighten or seal joints of pick-up wand.
	Air in material.	Agitate material to remove air.
Low output on upstroke	Piston cups, piston ball, or pump cylinder worn.	Inspect the piston cups, piston ball, and pump cylinder. Clean and replace any damaged components.

PROBLEM	CAUSE	SOLUTION
Pump does not run	Packing nut too tight	Loosen the packing nut and tighten just a little more then hand tight.
	Air Motor is stuck	Push the Reset button the bottom of the air motor valve.
	Fluid section or hose plugged. ***Danger: To prevent injury, always relieve fluid pressure before attempting to remove components.***	Disassemble and clean Fluid section. Replace any worn parts. Replace hose as required.
	Air not connected.	Check that air hose is connected at manifold, and regulator is at 20 psi or more.
	Air restricted.	Straighten any kinks in air hoses.
	Gun blocked or Seal rotated	Repair gun block or replace
	Gun is not opening	Check and repair gun triggering
Material in oil reservoir	Packing worn.	Replace packing set in lower part of the pump.
	Piston rod worn or scored.	Replace piston rod.
	Packing Nut too loose	Tighten the Packing Nut a little more then hand tight.
No Gel coat or Resin delivery on down stroke	Foot valve, spring retainer, or foot valve ball damaged or dirty.	Clean or replace foot valve, spring retainer, and foot valve ball. Be sure to lubricate ball thoroughly with Red Grease.
Hose leaks at fittings	Fitting loose	Tighten fitting. Check all fittings for leaks before operating.
	Fitting or nipple damaged.	Replace damaged parts.
	Crimped hose	If the hose has been sharply bent, the plastic liner may be ruptured. Remove and replace hose.

Air Lock in the Catalyst pump:

DANGER: Fluids Under High Pressure. Before performing any service and repair on this equipment, be sure to relieve air and fluid pressure.

DANGER: Always wear appropriate eye protection when working with this equipment.

WARNING: When removing hoses, place a rag over the hose before loosening it.

What is an Air Lock?

An air lock is an air bubble in the catalyst pump that blocks catalyst. The piston body moves inside the bubble of air instead of pumping catalyst.

If you have determined that there is an air lock in your catalyst pump, follow the procedures in this section.

1. Relieve line pressure from the catalyst pump by locking the gun open over an empty bucket. Leave the gun in this position.

WARNING: Relieve pressure from the catalyst pump before continuing.

2. Remove the catalyst hose from the nipple on the catalyst accumulator.

WARNING: When removing hose, place a rag over the hose and fitting before loosening it.

3. Remove the quick pin from the catalyst bearing block and upper slave arm.

4. Tilt the pump back toward the resin pump to release the bubble.

NOTE: If the bubble does not appear in the inlet tube, remove the lower quick pin and turn the pump upside-down.

5. Slowly hand-pump the catalyst into a suitable container until catalyst spurts from the nipple an equal amount on both the upstroke and down stroke.

6. Reconnect the catalyst hose to the nipple.

7. Hand-pump the catalyst pump until catalyst comes out through the gun.

8. Install the pump and quick pin into the slave arm.

9. Close the gun

Fluid Section Information:

VLS-4600 Fluid Section is a part of a modular system that can fit a multiple of applications and a multiple of configurations by changing a minimum of components. The VLS-4600 is designed to deliver power, versatility and rugged construction for long lasting use. This fluid section features Rapid Access Design (RAD) for easy access and maintenance.

Output Capabilities: Up to 8 – 10 lbs / min. (3.63 – 4.54 kg / min.), using GP resin of average viscosity. As a general rule in the standard 11:1 configuration it will pump a GP resin of 1200cps to 1500cps maximum.

Fluid Section	Pump Area (Sq. in)	Stroke Length	Displacement (in^3) / Stroke
VLS-4600	1.143 (7.37 sq. cm)	4" (101.6 mm)	4.5 (73.74 cc) (.074 liter)

Air Consumption: In a chopper application with 2 strands of glass 18cfm (.5 m^3 / min).

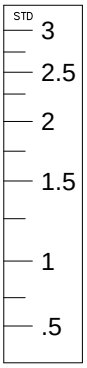
Filler loading: As a general rule using a GP resin and ATH or Calcium Carbonate in an 11:1 pump configuration you can fill up to 20% - 25%, in a 15:1 pump configuration up to 30% - 35%. Higher percentages can be achieved by using low viscosity resins specially designed for fillers. It is always a good idea to use resins that are designed for fillers as they will help keep the fillers in suspension. Using fillers will increase pump wear and maintenance.

Catalyst Pump Percentage Chart

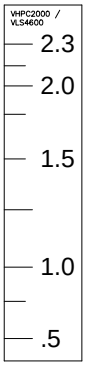
Catalyst Pump	VLS-4600
VHPC-2000	.5% - 2.3%
VHPC-1000	.5% - 3%
VHPC-4200	1% - 5.5%
VHPC-3200	2% - 12.5%
VHPC-2200	5% – 20% +-
VHPC-1200	7% – 25% +-

Power Head to Fluid Pump Ratio

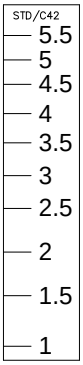
Power Head Diameter (in.)	VLS-4600	Air Consumption
VPH-3250	**6 to 1**	
VPH-4250	**11 to 1**	**9cfm (.25 m^3/ min.)**
VPH-5000	**15 to 1**	
VPH-7000-HD	**30 to 1**	



UPS-3101
VHPC-1000 Catalyst Pump &
VLS-4600 Fluid Section



UPS-3123
VHPC-2000 Catalyst Pump &
VLS-4600 Fluid Section



UPS-3122
VHPC-4200 Catalyst Pump &
VLS-4600 Fluid Section

Parts Drawings:

VLS-4600	**FLUID SECTION ASSEMBLY**
VLS-4600-HD	**FLUID SECTION ASSEMBLY – HEAVY DUTY**
VLS-4600-HD-SS	**FLUID SECTION ASSEMBLY – HD – STAINLESS**
VLS-4600-MP	**FLUID SECTION ASSEMBLY – MAGNAPAK**
VLS-4600-SS	**FLUID SECTION ASSEMBLY – STAINLESS**
VLS-4640-CK	**CONVERSION KIT – MAGNAPAK**
VLS-4600-1	**FLUID SECTION & FILTER ASSEMBLY**
VLS-4600-1-FIT	**FLUID SECTION & FILTER ASSEMBLY**
VLS-4600-1-FIT-HD	**FLUID SECTION & FILTER ASSEMBLY**
VLS-4600-1-HD	**FLUID SECTION & FILTER ASSEMBLY**
VLS-4600-1-MP	**FLUID SECTION & FILTER ASSEMBLY**
VLS-4600-1-MPFIT	**FLUID SECTION & FILTER ASSEMBLY**
VP-3100	**30:1 PUMP ASSEMBLY**
VP-3100-HD	**30:1 PUMP ASSEMBLY – HEAVY DUTY**
VP-41100	**11:1 PUMP ASSEMBLY**
VLS-46RK-4T-2T-SS	**REPAIR KIT – SS FLUID SECTION**
VLS-46-RK-4T-2T	**REPAIR KIT**
VLS-46RK-MP	**MAGNAPAK REPAIR KIT**
DLS-4600	**FLUID SECTION ASSEMBLY – DUO UNIT**
DLS-4600-SS	**FLUID SECTION ASSEMBLY – STAINLESS STEEL**
DLS-4600-1	**FLUID SECTION & FILTER ASSEMBLY**
MCPA-4600	**FLUID SECTION ASSEMBLY - MULTICOLOR**
UPLS-4600	**FLUID SECTION ASSEMBLY – UP UNITS**
UPLS-4600-SS	**FLUID SECTION ASSEMBLY – SS UP UNITS**

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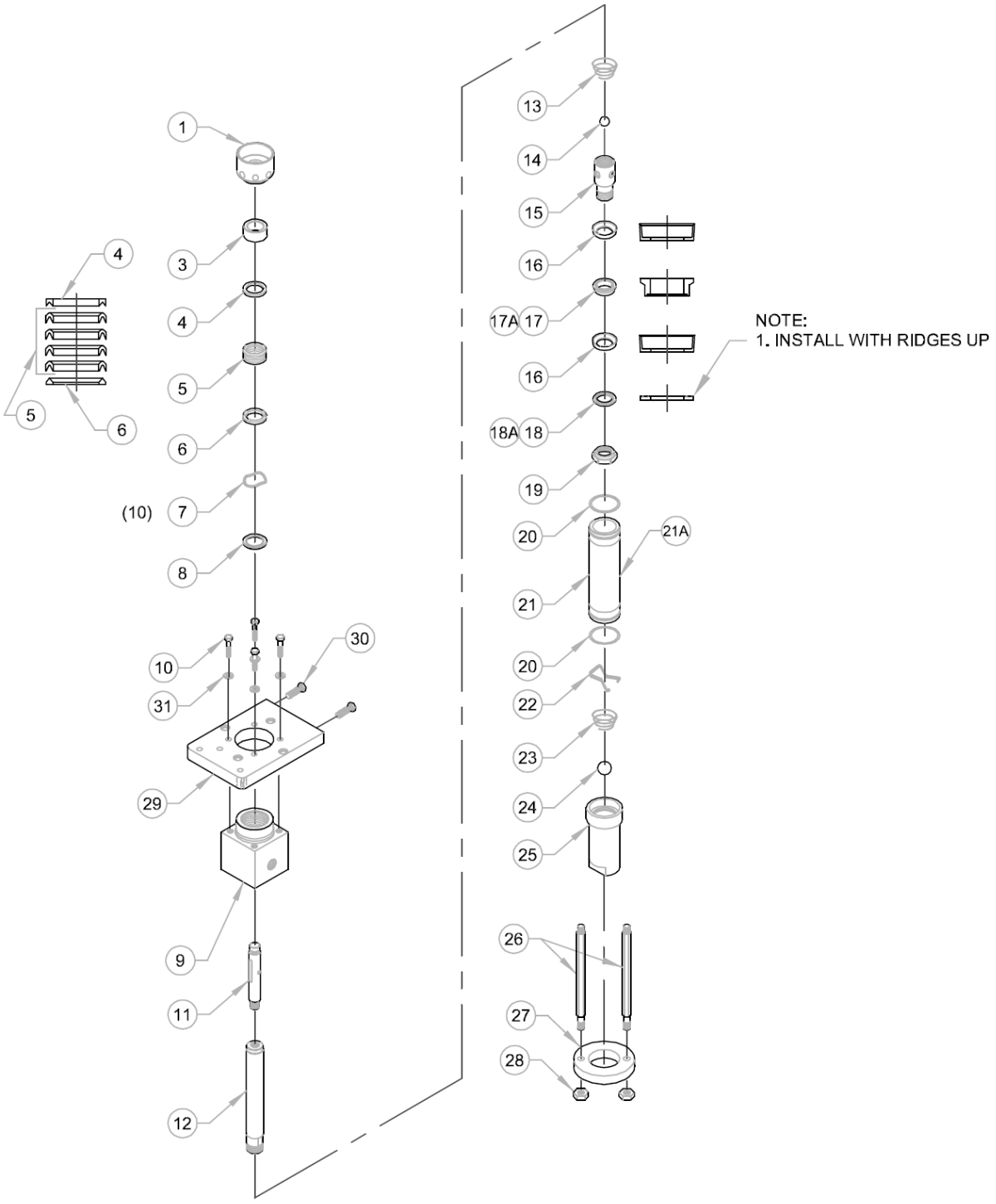


MAGNUM VENUS PLASTECH

FLUID SECTION ASSEMBLY	VLS-4600

REV. D = ADDED (*) TO ALL KIT ITEMS 7/8/05 BT2
REV. E = ADDED ITEMS 31 10/10/05 BT2
REV. F = ADDED ITEMS 17A, & 18A 9/21/06 JEM
REV. G = REORIENTED PART 9 ON DRAWING 01/30/14 BT2

Fluid Section Assy VLS-4600
PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
1	VLS-4607	1	SOLVENT CUP PKG NUT
3	VLS-4603	1	GUIDE BEARING
4	VLS-4604	1	FEMALE COMP RING
* 5	VLS-4605	1	PACKING SET SPA
6	VLS-4606	1	MALE COMPRESSION RING
7	VLS-4610	10	WAVE SPRING
8	VLS-4611	1	SPRING SUPPORT RING
9	VLS-4601	1	OUTLET BODY
10	F-HB-06C-24-GR8	4	HEX HEAD BOLT
11	VLS-4613	1	PISTON ROD ADAPTER
12	VLS-4609	1	PISTON ROD
13	VLS-4614	1	PISTON BALL SPRING
* 14	ALS-1018	1	7/8" CHROME BALL
15	VLS-4619	1	PISTON BODY
* 16	VLS-4615	2	PISTION CUP
17	VLS-4616	1	PISTON CUP SPACER
18	VLS-4617	1	PISTON CUP BACK-UP
19	VLS-4618	1	PISTON NUT
* 20	O-V-137-90	2	O-RING
21	VLS-4608	1	CYLINDER
22	VLS-4620	1	BALL STOP
23	VLS-4621	1	FOOT VALVE BALL SPRING
* 24	VLS-4622	1	1 1/4" CHROME BALL
25	VLS-4602	1	FOOT VALVE
26	VLS-4623	2	PUMP CYLINDER TIE ROD
27	VLS-4624	1	FOOT VALVE COLLAR
28	F-HN-08C	2	1/2" UNC HEX NUT
29	VLS-4612	1	PUMP MOUNT PLATE
30	F-HB-08C-16	2	HEX HEAD BOLT
31	F-SW-06C	4	LOCK WASHER

REPAIR KITS

PART NO.	DESCRIPTION
* VLS-46RK-4T-2T	REPAIR KIT

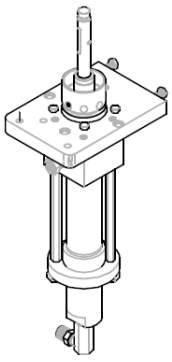
TOOLS

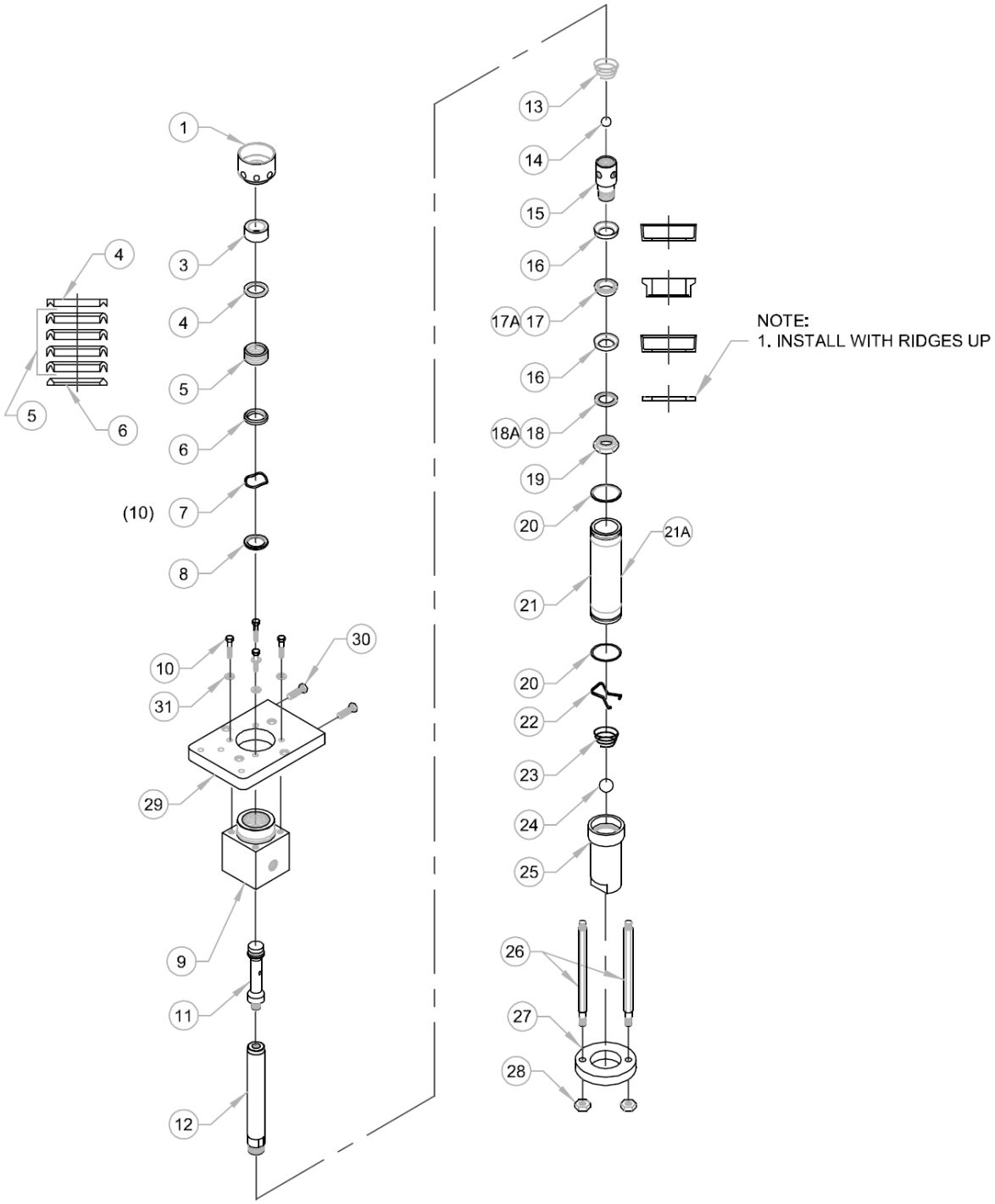
PART NO.	DESCRIPTION
45011-1	PISTON BODY WRENCH

OPTIONAL PARTS AND ASSY
PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
	* 6706-2-1	1	PUMP GREASE
17A	3101-13-2	1	HARDENED SPACER
18A	3101-14-2	1	HARDENED BACK-UP RING
21A	3101-24-1	1	HARDENED CYLINDER

FIGURE 1-A





MAGNUM VENUS PLASTECH

FLUID SECTION ASSEMBLY	VLS-4600-HD

REV. - 03/20/09 BT2
REV. A - REORIENTED PART 9 IN DRAWING 01/30/14 BT2

Fluid Section Assy VLS-4600-HD
PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
1	VLS-4607	1	SOLVENT CUP PKG NUT
3	VLS-4603	1	GUIDE BEARING
4	VLS-4604	1	FEMALE COMP RING
* 5	VLS-4605	1	PACKING SET SPA
6	VLS-4606	1	MALE COMPRESSION RING
7	VLS-4610	10	WAVE SPRING
8	VLS-4611	1	SPRING SUPPORT RING
9	VLS-4601	1	OUTLET BODY
10	F-HB-06C-24-GR8	4	HEX HEAD BOLT
11	VLS-4613-HD	1	PISTON ROD ADAPTER
12	VLS-4609	1	PISTON ROD
13	VLS-4614	1	PISTON BALL SPRING
* 14	ALS-1018	1	7/8" CHROME BALL
15	VLS-4619	1	PISTON BODY
* 16	VLS-4615	2	PISTION CUP
17	VLS-4616	1	PISTON CUP SPACER
18	VLS-4617	1	PISTON CUP BACK-UP
19	VLS-4618	1	PISTON NUT
* 20	O-V-137-90	2	O-RING
21	VLS-4608	1	CYLINDER
22	VLS-4620	1	BALL STOP
23	VLS-4621	1	FOOT VALVE BALL SPRING
* 24	VLS-4622	1	1 1/4" CHROME BALL
25	VLS-4602	1	FOOT VALVE
26	VLS-4623	2	PUMP CYLINDER TIE ROD
27	VLS-4624	1	FOOT VALVE COLLAR
28	F-HN-08C	2	1/2" UNC HEX NUT
29	VLS-4612	1	PUMP MOUNT PLATE
30	F-HB-08C-16	2	HEX HEAD BOLT
31	F-SW-06C	4	LOCK WASHER

REPAIR KITS

PART NO.	DESCRIPTION
* VLS-46RK-4T-2T	REPAIR KIT

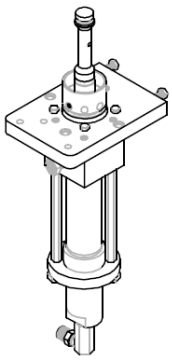
TOOLS

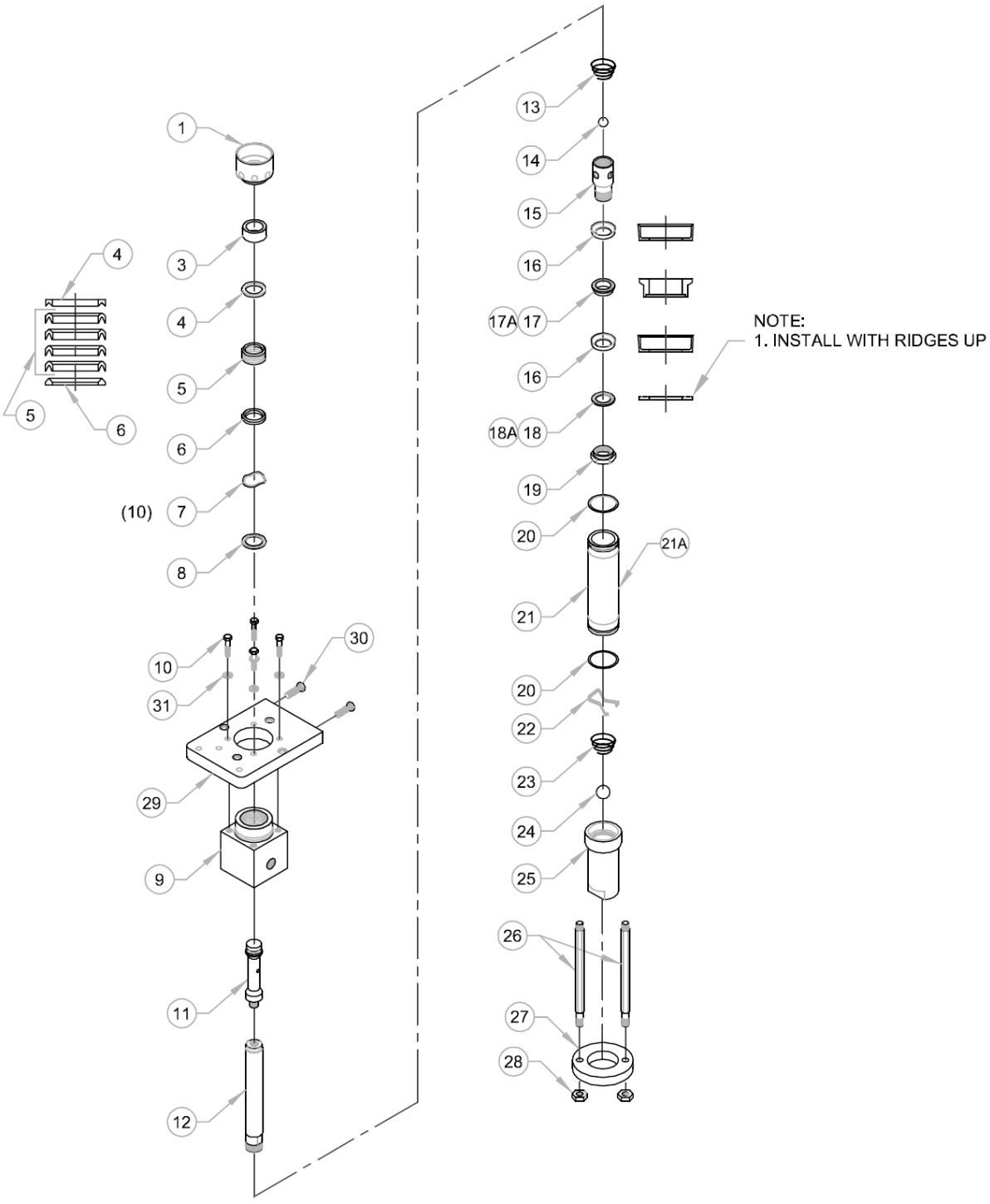
PART NO.	DESCRIPTION
45011-1	PISTON BODY WRENCH

OPTIONAL PARTS AND ASSY
PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
	* 6706-2-1	1	PUMP GREASE
17A	3101-13-2	1	HARDENED SPACER
18A	3101-14-2	1	HARDENED BACK-UP RING
21A	3101-24-1	1	HARDENED CYLINDER

FIGURE 1-A





MAGNUM VENUS PLASTECH

FLUID SECTION ASSEMBLY	VLS-4600-HD-SS

REV. - 03/24/09 BT2
REV. A - REORIENTED PART 9 IN DRAWING 01/30/14 BT2

Fluid Section Assy VLS-4600-HD-SS

PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
1	VLS-4607	1	SOLVENT CUP PACKING NUT
3	VLS-4603	1	GUIDE BEARING
4	VLS-4604-SS	1	FEMALE COMPRESSION RING
* 5	VLS-4605	1	PACKING SET SPA
6	VLS-4606-SS	1	MALE COMPRESSION RING
7	VLS-4610	10	WAVE SPRING
8	VLS-4611	1	SPRING SUPPORT RING
9	VLS-4601-SS	1	OUTLET BODY
10	F-HB-06C-24-GR8	4	HEX BOLT
11	VLS-4613-HD	1	PISTON ROD ADAPTER
12	VLS-4609-SS	1	PISTON ROD
13	VLS-4614	1	PISTON BALL SPRING
* 14	03071	1	7/8" SS BALL
15	VLS-4619-SS	1	PISTON BODY
* 16	VLS-4615	2	PISTON CUP
17	VLS-4616-SS	1	PISTON CUP SPACER
18	VLS-4617-SS	1	PISTON CUP BACK-UP
19	VLS-4618-SS	1	PISTON NUT
* 20	O-V-137-90	2	O-RING
21	VLS-4608-SS	1	CYLINDER
22	VLS-4620-SS	1	BALL STOP
23	VLS-4621	1	FOOT VALVE BALL SPRING
* 24	VLS-4622-SS	1	1 1/4" SS BALL
25	VLS-4602-SS	1	FOOT VALVE
26	VLS-4623	2	PUMP CYLINDER TIE ROD
27	VLS-4624	1	FOOT VALVE COLLAR
28	F-HN-08C	2	HEX NUT
29	VLS-4612	1	PUMP MOUNT PLATE
30	F-HB-08C-16	2	HEX BOLT
31	F-SW-06	4	LOCK WASHER

REPAIR KITS

PART NO.	DESCRIPTION
* VLS-46RK-4T-2T-SS	REPAIR KIT

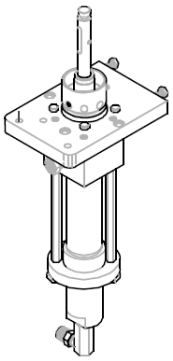
TOOLS

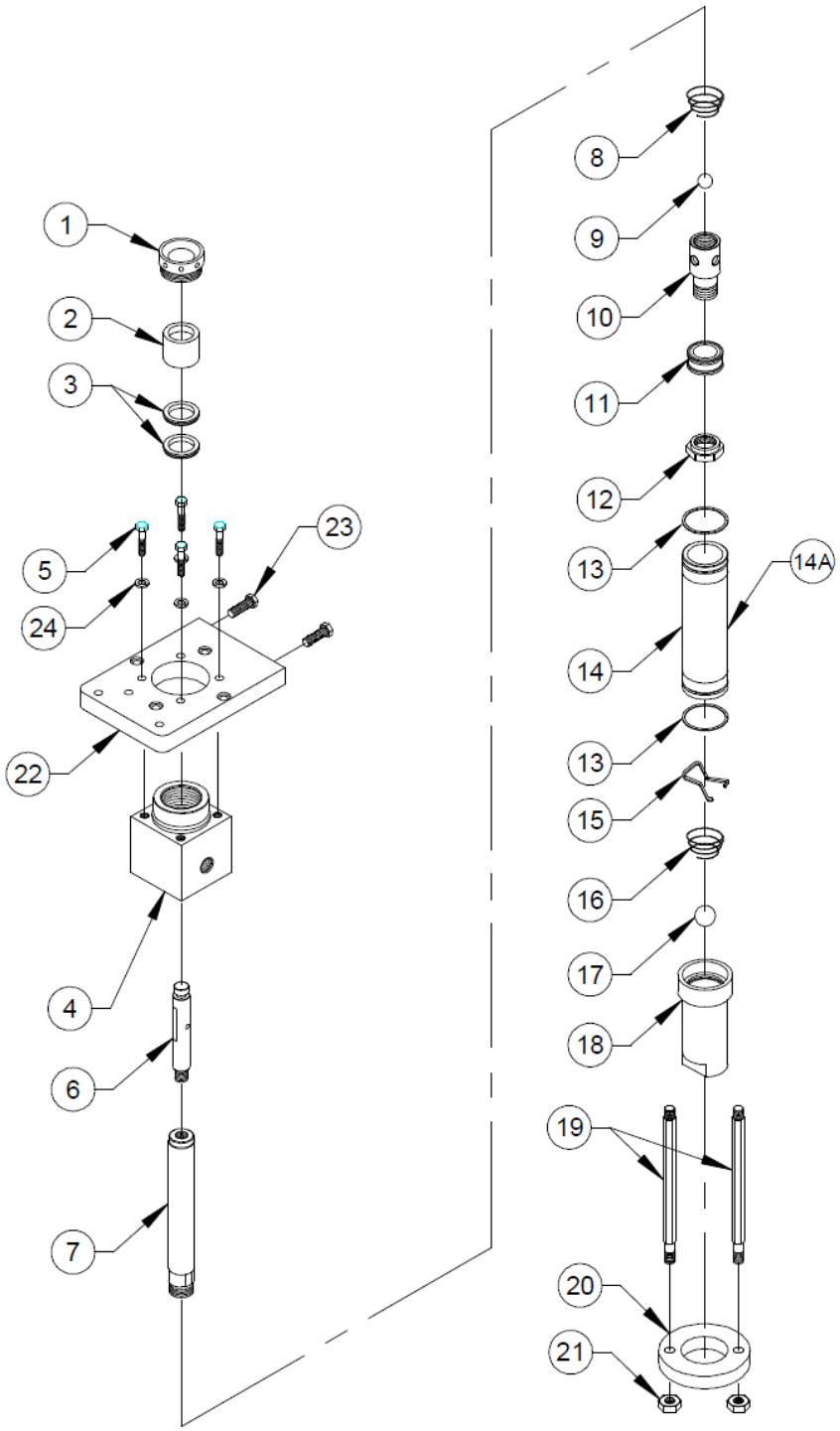
PART NO.	DESCRIPTION
45011-1	PISTON BODY WRENCH

OPTIONAL PARTS AND ASSY PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
	* 6706-2-1	1	PUMP GREASE
17A	3101-13-2	1	HARDENED SPACER
18A	3101-14-2	1	HARDENED BACK-UP RING
21A	3101-24-1	1	HARDENED CYLINDER

FIGURE 1-A





MAGNUM VENUS PRODUCTS

FLUID SECTION ASSEMBLY	VLS-4600-MP

REV. - 09/13/06 BT2

Fluid Section Assy VLS-4600-MP

PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
1	VLS-4631	1	RETAINING NUT
2	VLS-4632	1	BUSHING
* 3	VLS-4640	2	CUP SEAL
4	VLS-4601	1	OUTLET BODY
5	F-HB-06C-24-GR8	4	HEX BOLT
6	VLS-4613	1	PISTON ROD ADAPTER
7	VLS-4609	1	PISTON ROD
8	VLS-4614	1	PISTON BALL SPRING
* 9	ALS-1018	1	7/8" BALL
10	VLS-4619	1	PISTON BODY
*11	VLS-4633	1	PISTON SEAL
12	VLS-4618	1	PISTON NUT
*13	O-V-137-90	2	O-RING
14	VLS-4608	1	CYLINDER
15	VLS-4620	1	BALL STOP
16	VLS-4621	1	FOOT VALVE BALL SPRING
*17	VLS-4622	1	1-1/4" BALL
18	VLS-4602	1	FOOT VALVE
19	VLS-4623	2	PUMP CYLINDER TIE ROD
20	VLS-4624	1	FOOT VALVE COLLAR
21	F-HN-08C	2	HEX NUT
22	VLS-4612	1	PUMP MOUNT PLATE
23	F-HB-08C-16	2	HEX BOLT
24	F-SW-06	4	LOCK WASHER

REPAIR KITS

PART NO.	DESCRIPTION
* VLS-46RK-MP	REPAIR KIT

TOOLS

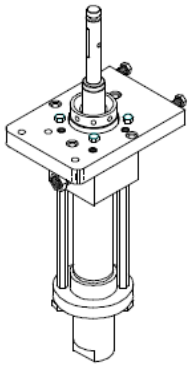
PART NO.	DESCRIPTION
45011-1	PISTON BODY WRENCH

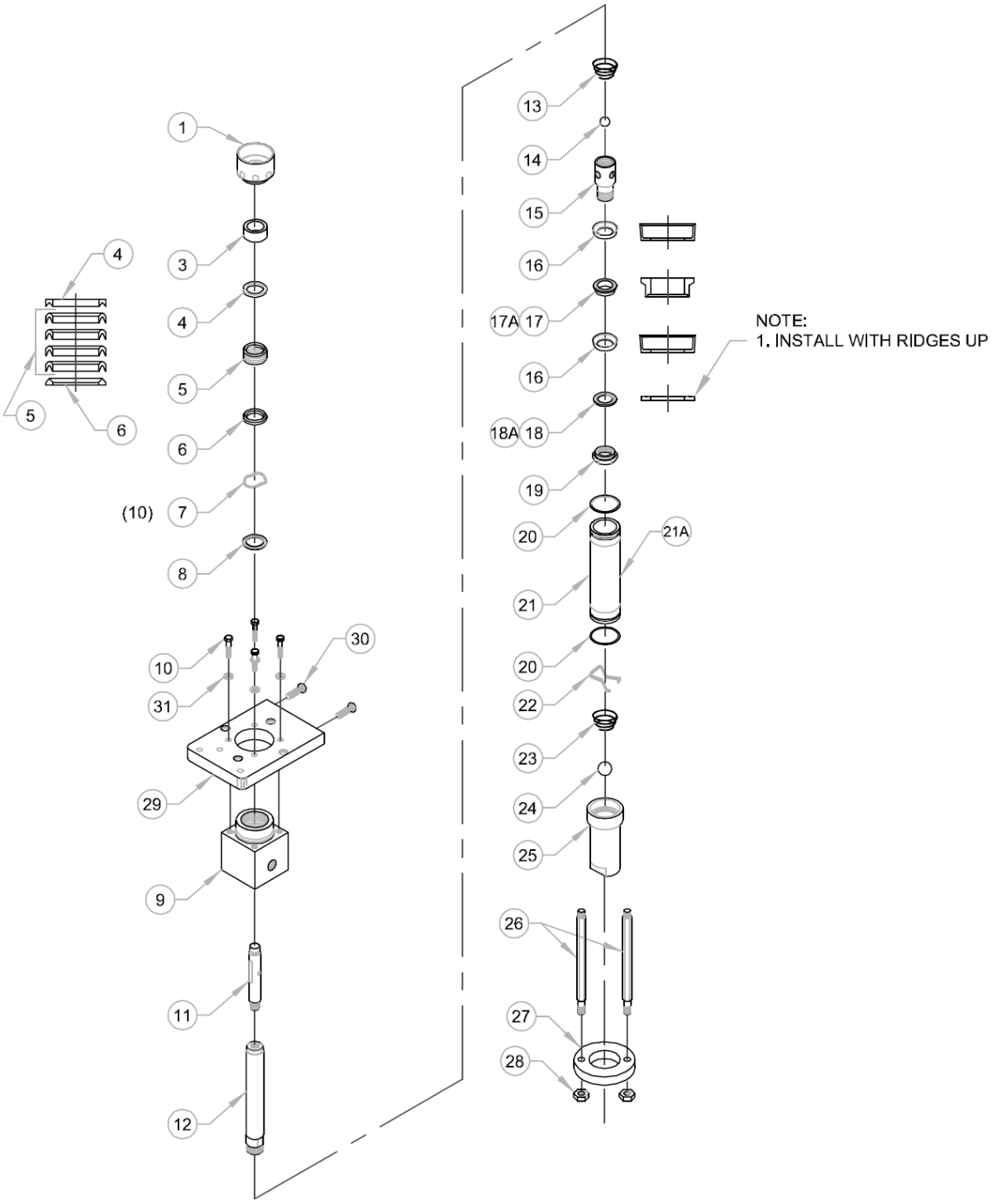
OPTIONAL PARTS AND ASSEMBLIES

PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
14A	3101-24-1	1	HARDENED CYLINDER
	* 6706-2-1	1	PUMP GREASE

FIGURE 1-1





MAGNUM VENUS PLASTECH

FLUID SECTION ASSEMBLY	VLS-4600-SS

REV. - 06/30/08 BT2
REV. A - REORIENTED PART 9 IN DRAWING 01/30/14 BT2

Fluid Section Assy VLS-4600-SS

PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
1	VLS-4607	1	SOLVENT CUP PKG NUT
3	VLS-4603	1	GUIDE BEARING
4	VLS-4604-SS	1	FEMALE COMP RING
* 5	VLS-4605	1	PACKING SET SPA
6	VLS-4606-SS	1	MALE COMPRESSION RING
7	VLS-4610	10	WAVE SPRING
8	VLS-4611	1	SPRING SUPPORT RING
9	VLS-4601-SS	1	OUTLET BODY
10	F-HB-06C-24-GR8	4	HEX HEAD BOLT
11	VLS-4613	1	PISTON ROD ADAPTER
12	VLS-4609-SS	1	PISTON ROD
13	VLS-4614	1	PISTON BALL SPRING
* 14	03071	1	7/8" SS BALL
15	VLS-4619-SS	1	PISTON BODY
* 16	VLS-4615	2	PISTON CUP
17	VLS-4616-SS	1	PISTON CUP SPACER
18	VLS-4617-SS	1	PISTON CUP BACK-UP
19	VLS-4618-SS	1	PISTON NUT
* 20	O-V-137-90	2	O-RING
21	VLS-4608-SS	1	CYLINDER
22	VLS-4620-SS	1	BALL STOP
23	VLS-4621	1	FOOT VALVE BALL SPRING
* 24	VLS-4622-SS	1	1 1/4" SS BALL
25	VLS-4602-SS	1	FOOT VALVE
26	VLS-4623	2	PUMP CYLINDER TIE ROD
27	VLS-4624	1	FOOT VALVE COLLAR
28	F-HN-08C	2	1/2" UNC HEX NUT
29	VLS-4612	1	PUMP MOUNT PLATE
30	F-HB-08C-16	2	HEX HEAD BOLT
31	F-SW-06	4	LOCK WASHER

REPAIR KITS

PART NO.	DESCRIPTION
* VLS-46RK-4T-2T-SS	REPAIR KIT

TOOLS

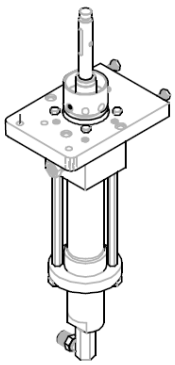
PART NO.	DESCRIPTION
45011-1	PISTON BODY WRENCH

OPTIONAL PARTS AND ASSY

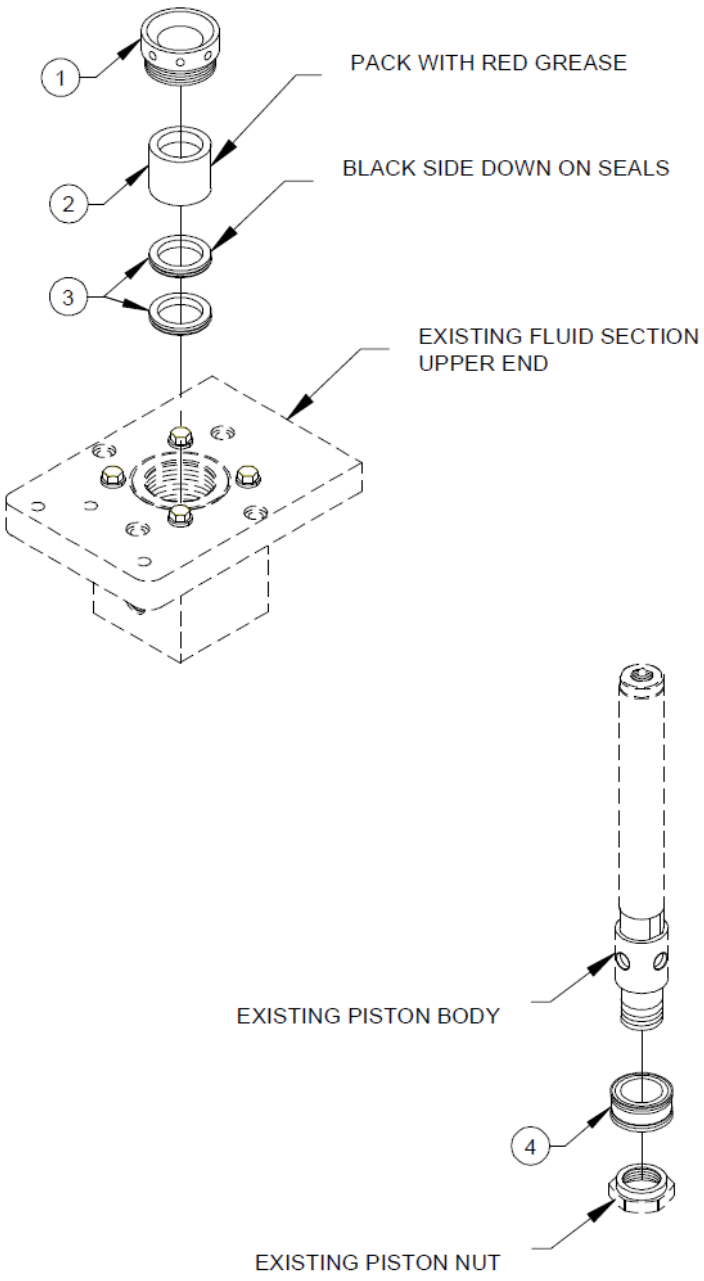
PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
	* 6706-2-1	1	PUMP GREASE
17A	3101-13-2	1	HARDENED SPACER
18A	3101-14-2	1	HARDENED BACK-UP RING
21A	3101-24-1	1	HARDENED CYLINDER

FIGURE 1-A



USE PATRIOT OIL ONLY



MAGNUM VENUS PRODUCTS

MAGNAPAK SEAL CONVERSION KIT	VLS-4640-CK

REV. - 11/23/05 BT2
REV. A - ITEM 3 WAS QTY. OF 1 11/23/05 BT2
REV. B - ADDED PAT-LS-OIL AND PATRIOT OIL NOTE

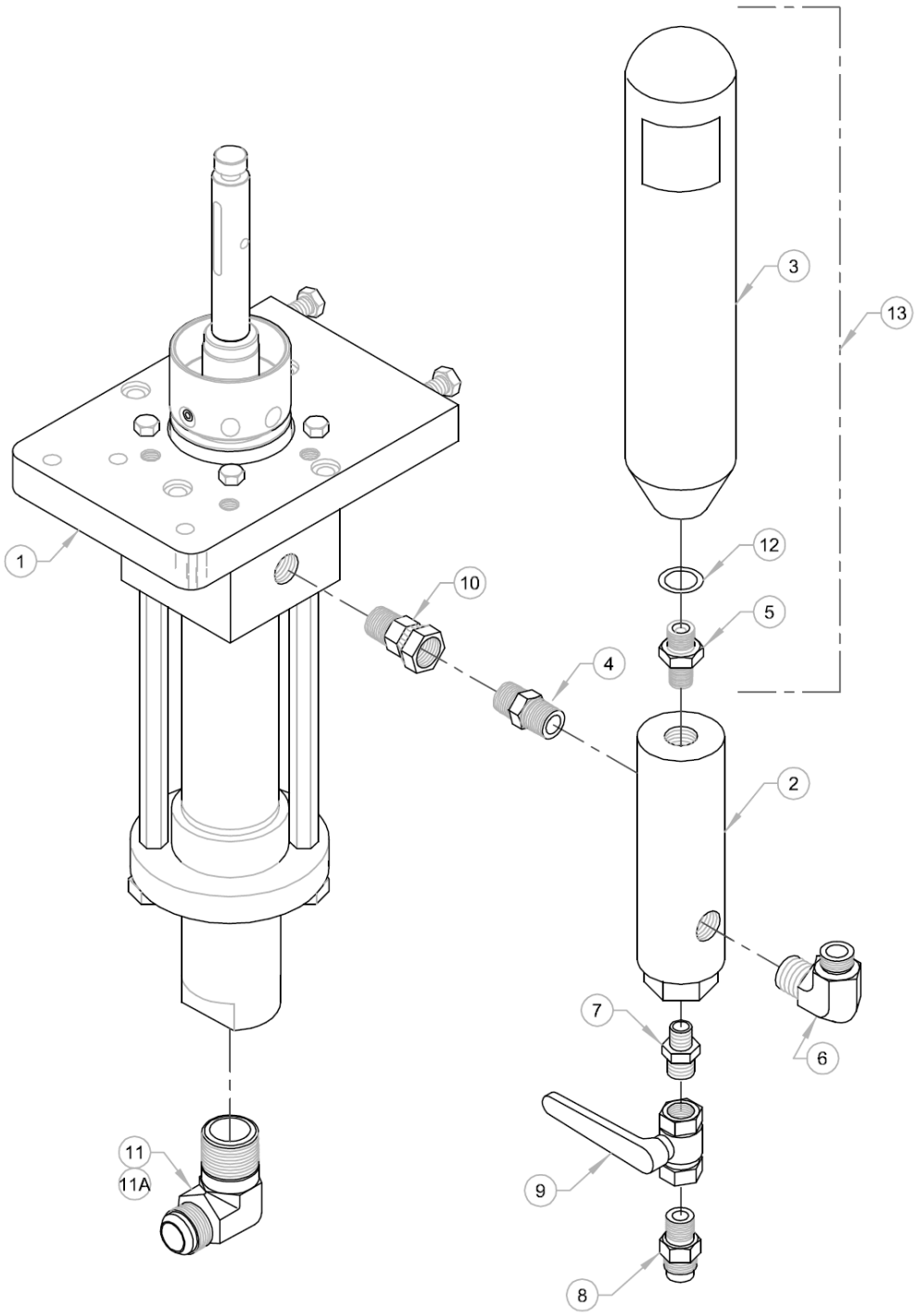
SEAL CONVERSION KIT VLS-4640-CK

PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
1	VLS-4631	1	RETAINING NUT
2	VLS-4632	1	BUSHING
3	VLS-4640	2	CUP SEAL
4	VLS-4633	1	PISTON SEAL

INCLUDED IN CONVERSION KIT

PART NO.	QTY	DESCRIPTION
PAT-LS-OIL	1	LOWER SECTION OIL



MAGNUM VENUS PLASTECH

Fluid Section & Filter Assembly	VLS-4600-1

REV. 2/20/03 JEM
REV. A - CORRECTED ILLUSTRATION AND DESCRIPTION OF ITEM 4 05/24/11 BT2
REV. B - ADDED OPTIONAL PART 11A, ADDED ITEM 13 TO OPTIONAL ASSEMBLIES 05/21/14 BT2

Fluid Section & Filter Assembly VLS-4600-1

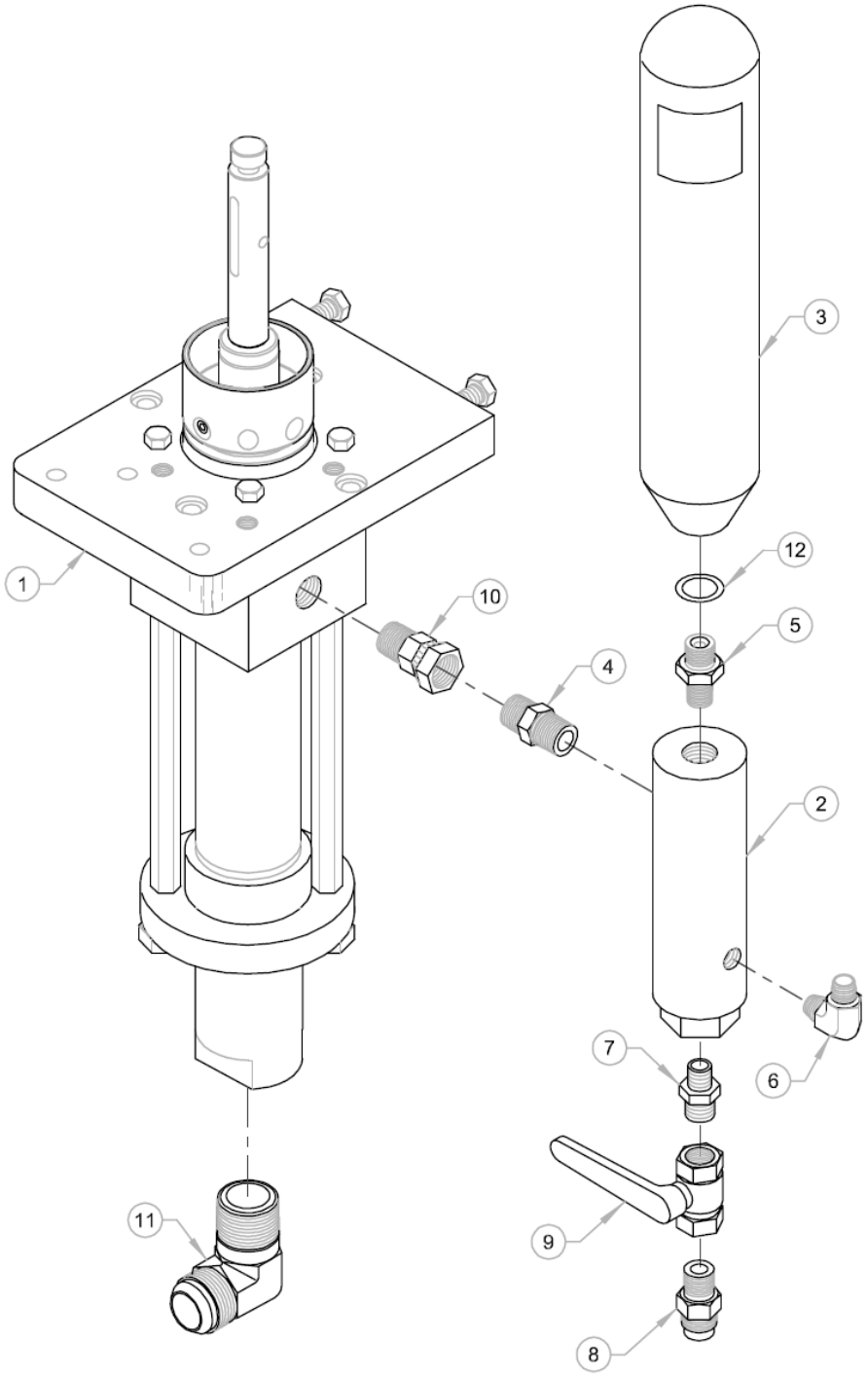
PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
1	VLS-4600	1	FLUID SECTION ASSEMBLY
2	FF-5000-30	1	FLUID FILTER
3	SC-6000-1	1	SURGE CHAMBER
4	PF-HN-08	1	NIPPLE
5	PF-HN-12SC-08	1	NIPPLE
6	PF-ME-08-06	1	MALE ELBOW
7	PF-HN-04	1	NIPPLE
8	PF-HN-04-04S	1	NIPPLE
9	BV-44-HP	1	BALL VALVE
10	PF-SW-12M-08F	1	SWIVEL FITTING
11	PF-ME-16-12J	1	MALE ELBOW
12	O-V-210	1	O-RING

OPTIONAL PARTS AND ASSEMBLIES

PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
11A	PF-ME-16-16J	1	MALE ELBOW FOR INTERNATIONAL UNITS
13	SC-6000	1	SURGE CHAMBER ASSEMBLY (INCLUDES ITEMS 3, 5, & 12)



MAGNUM VENUS PLASTECH

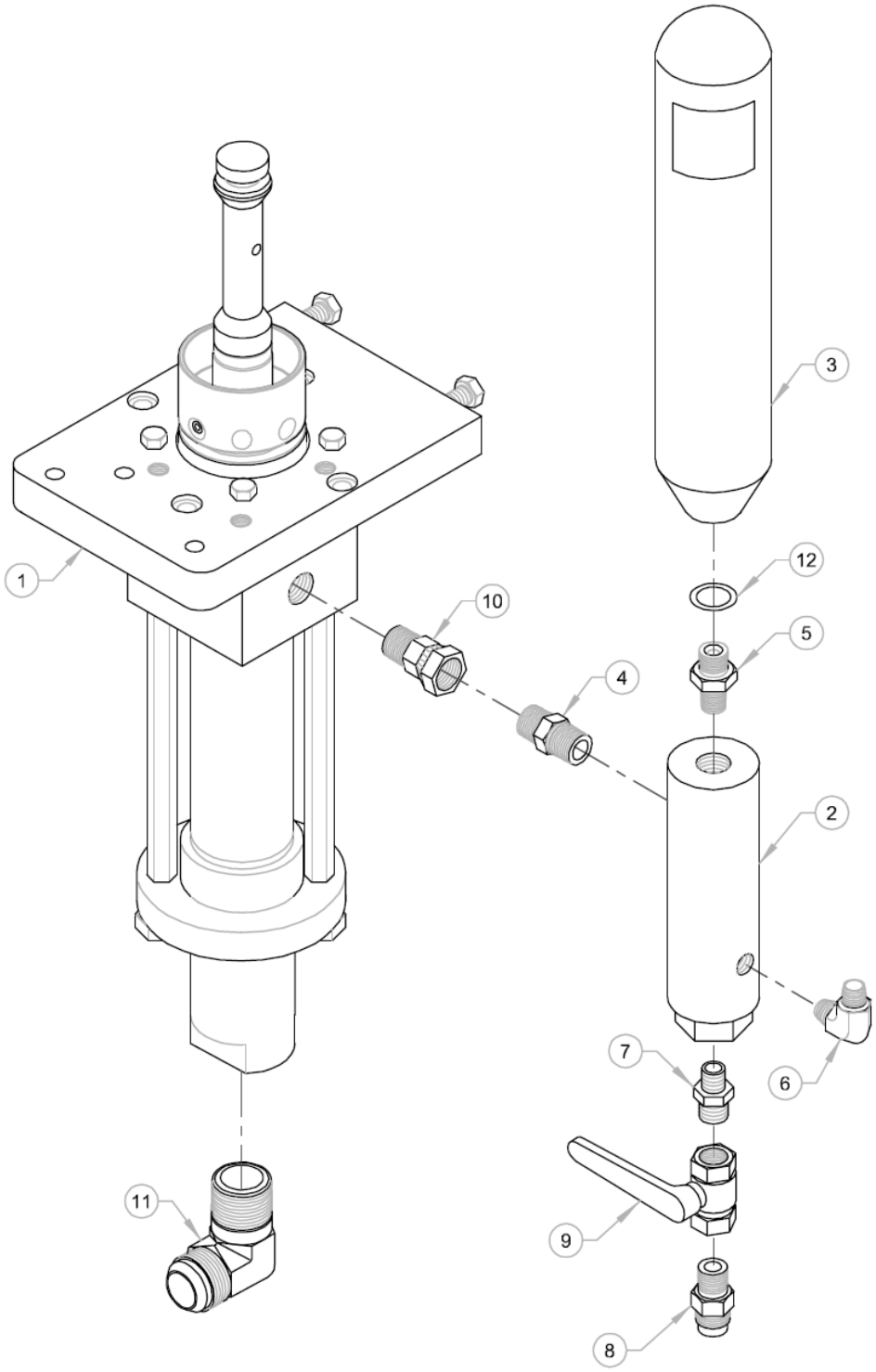
Fluid Section & Filter Assembly	VLS-4600-1-FIT

REV. 2/20/03 JEM
REV. A - CORRECTED ILLUSTRATION AND DESCRIPTION OF ITEM 4 05/24/11 BT2

Fluid Section & Filter Assembly VLS-4600-1-FIT

PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
1	VLS-4600	1	FLUID SECTION ASSEMBLY
2	FF-5000-30	1	FLUID FILTER
3	SC-6000	1	SURGE CHAMBER
4	PF-HN-08	1	NIPPLE
5	PF-HN-12SC-08	1	NIPPLE
6	PF-ME-08	1	MALE ELBOW
7	PF-HN-04	1	NIPPLE
8	PF-HN-04-04S	1	NIPPLE
9	BV-44-HP	1	BALL VALVE
10	PF-SW-12M-08F	1	SWIVEL FITTING
11	PF-ME-16J-16	1	MALE ELBOW
12	O-V-210	1	O-RING



MAGNUM VENUS PLASTECH

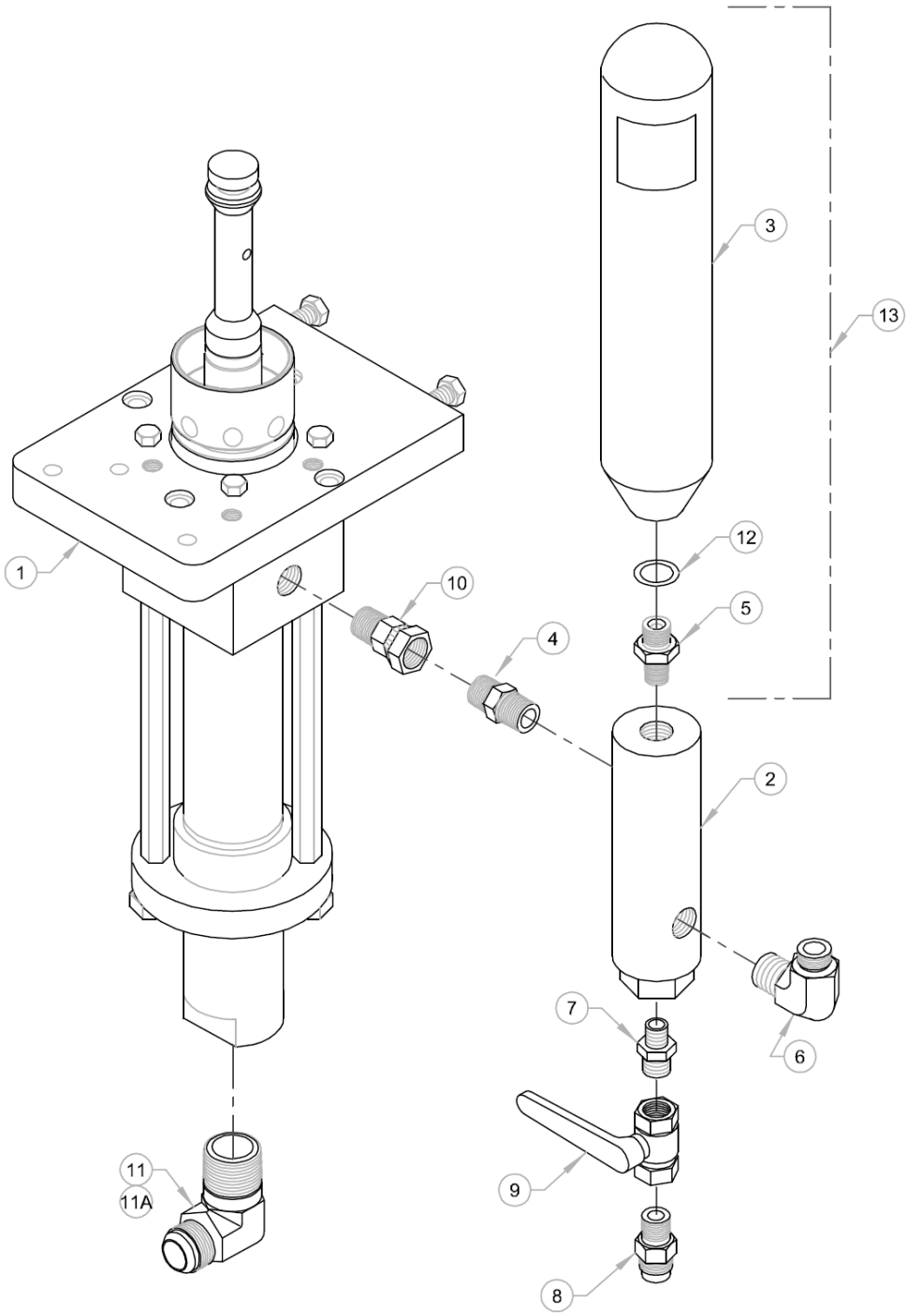
Fluid Section & Filter Assembly	VLS-4600-1-FIT-HD

REV. 03/20/09 BT2
REV. A - CORRECTED ILLUSTRATION AND DESCRIPTION OF ITEM 4 05/24/11 BT2

Fluid Section & Filter Assembly VLS-4600-1-FIT-HD

PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
1	VLS-4600-HD	1	FLUID SECTION ASSEMBLY
2	FF-5000-30	1	FLUID FILTER
3	SC-6000	1	SURGE CHAMBER
4	PF-HN-08	1	NIPPLE
5	PF-HN-12SC-08	1	NIPPLE
6	PF-ME-08	1	MALE ELBOW
7	PF-HN-04	1	NIPPLE
8	PF-HN-04-04S	1	NIPPLE
9	BV-44-HP	1	BALL VALVE
10	PF-SW-12M-08F	1	SWIVEL FITTING
11	PF-ME-16J-16	1	MALE ELBOW
12	O-V-210	1	O-RING



MAGNUM VENUS PLASTECH

Fluid Section & Filter Assembly	VLS-4600-1-HD

REV. 03-20-09 BT2
REV. A - CORRECTED ILLUSTRATION AND DESCRIPTION OF ITEM 4 05/24/11 BT2
REV. B - ADDED OPTIONAL PART 11A, ADDED ITEM 13 TO OPTIONAL ASSEMBLIES 05/21/14 BT2

Fluid Section & Filter Assembly VLS-4600-1-HD

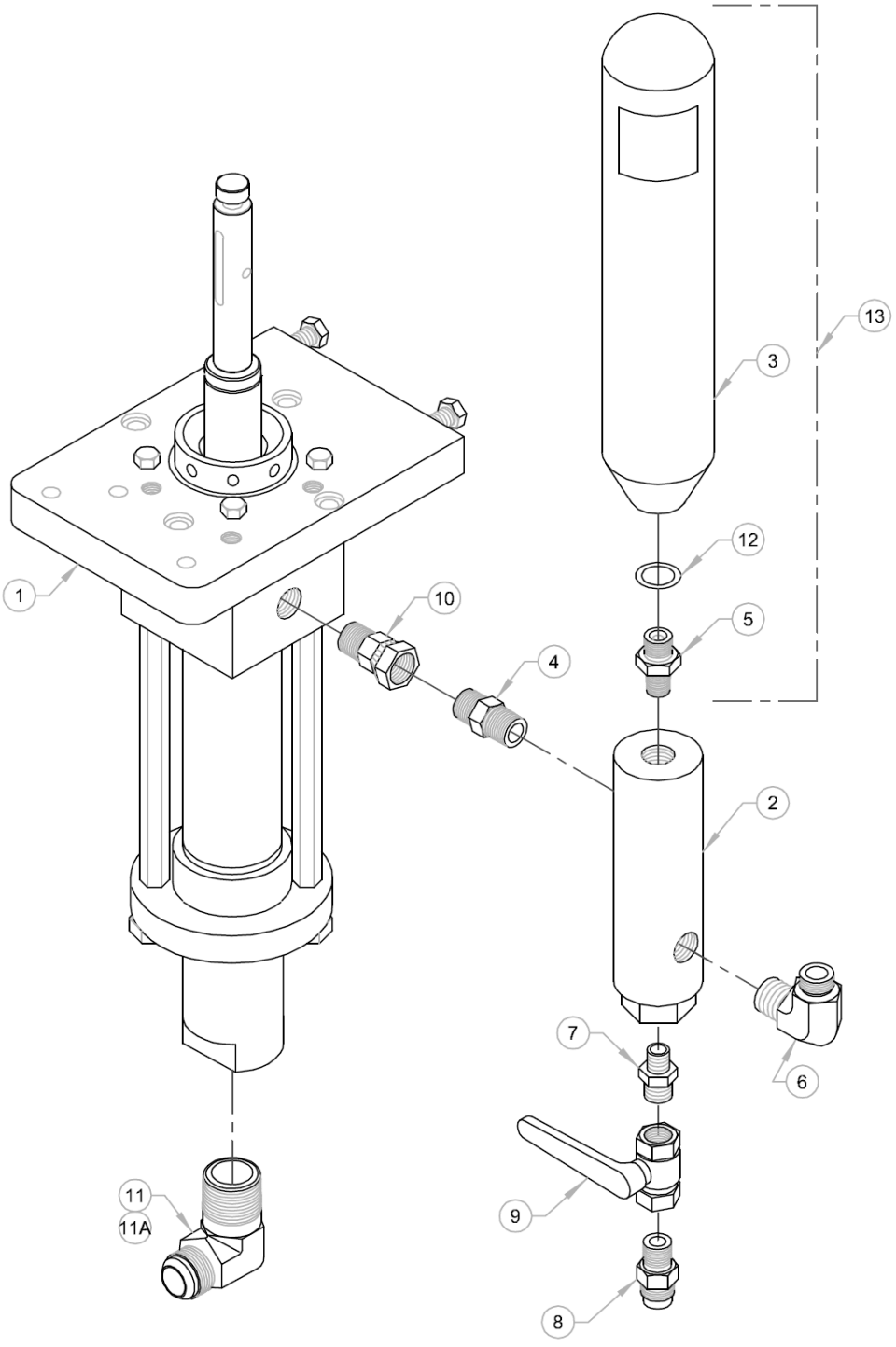
PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
1	VLS-4600-HD	1	FLUID SECTION ASSEMBLY
2	FF-5000-30	1	FLUID FILTER
3	SC-6000-1	1	SURGE CHAMBER
4	PF-HN-08	1	NIPPLE
5	PF-HN-12SC-08	1	NIPPLE
6	PF-ME-08-06	1	MALE ELBOW
7	PF-HN-04	1	NIPPLE
8	PF-HN-04-04S	1	NIPPLE
9	BV-44-HP	1	BALL VALVE
10	PF-SW-12M-08F	1	SWIVEL FITTING
11	PF-ME-16-12J	1	MALE ELBOW
12	O-V-210	1	O-RING

OPTIONAL PARTS AND ASSEMBLIES

PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
11A	PF-ME-16-16J	1	MALE ELBOW FOR INTERNATIONAL UNITS
13	SC-6000	1	SURGE CHAMBER ASSEMBLY (INCLUDES ITEMS 3, 5, & 12)



MAGNUM VENUS PLASTECH

Fluid Section & Filter Assembly	VLS-4600-1-MP

REV. 09/14/06 BT2
REV. A - ADDED OPTIONAL PART 11A, ADDED ITEM 13 TO OPTIONAL ASSEMBLIES 05/21/14 BT2

Fluid Section & Filter Assembly VLS-4600-1-MP

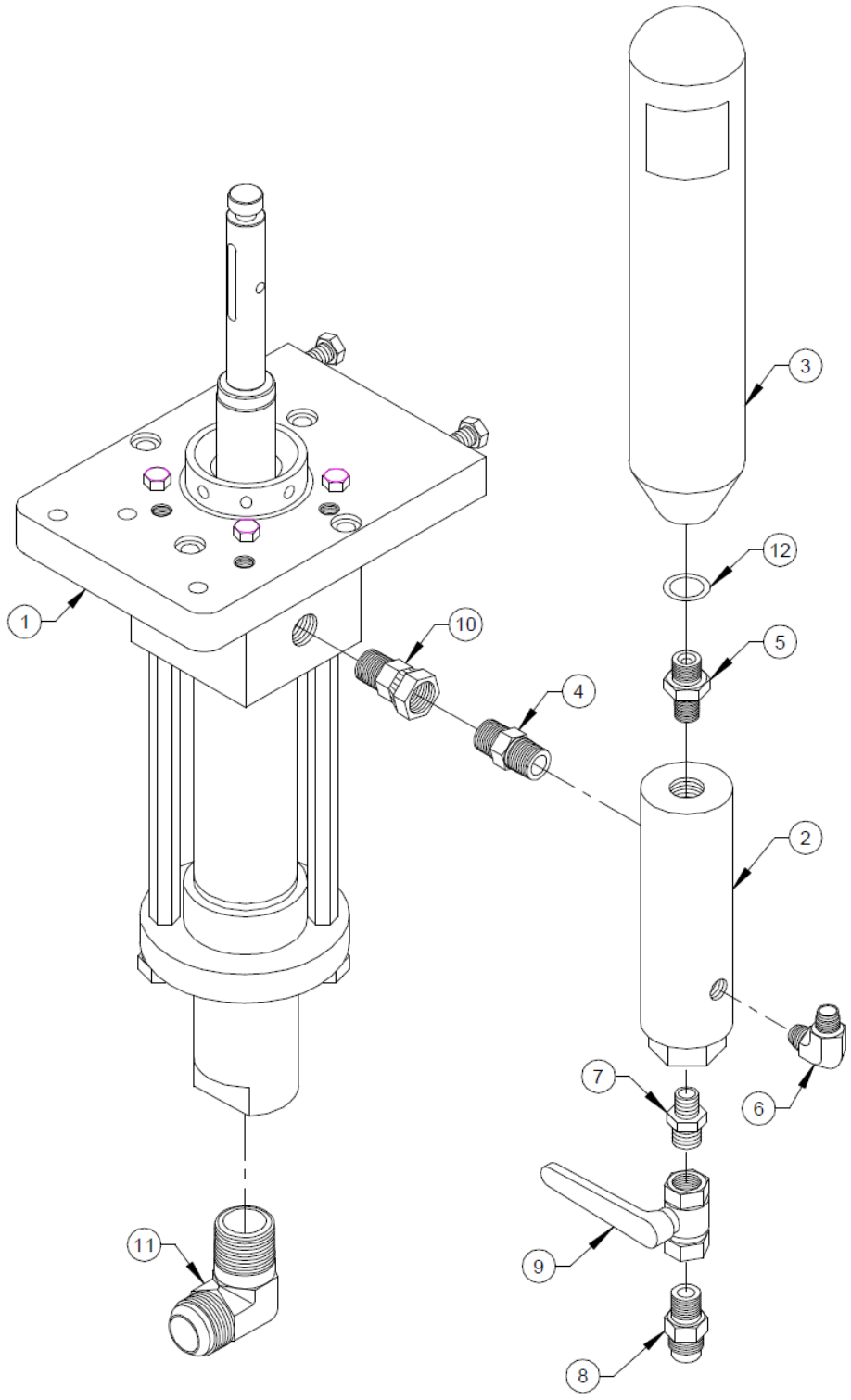
PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
1	VLS-4600-MP	1	FLUID SECTION ASSEMBLY
2	FF-5000-30	1	FLUID FILTER
3	SC-6000-1	1	SURGE CHAMBER
4	PF-HN-08	1	NIPPLE
5	PF-HN-12SC-08	1	NIPPLE
6	PF-ME-08-06	1	MALE ELBOW
7	PF-HN-04	1	NIPPLE
8	PF-HN-04-04S	1	NIPPLE
9	BV-44-HP	1	BALL VALVE
10	PF-SW-12M-08F	1	SWIVEL FITTING
11	PF-ME-16-12J	1	MALE ELBOW
12	O-V-210	1	O-RING

OPTIONAL PARTS AND ASSEMBLIES

PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
11A	PF-ME-16-16J	1	MALE ELBOW FOR INTERNATIONAL UNITS
13	SC-6000	1	SURGE CHAMBER ASSEMBLY (ITEMS 3, 5, & 12)



MAGNUM VENUS PRODUCTS

Fluid Section & Filter Assembly	VLS-4600-1-MPFIT

REV. 09/14/06 BT2

Fluid Section & Filter Assembly VLS-4600-1-MPFIT

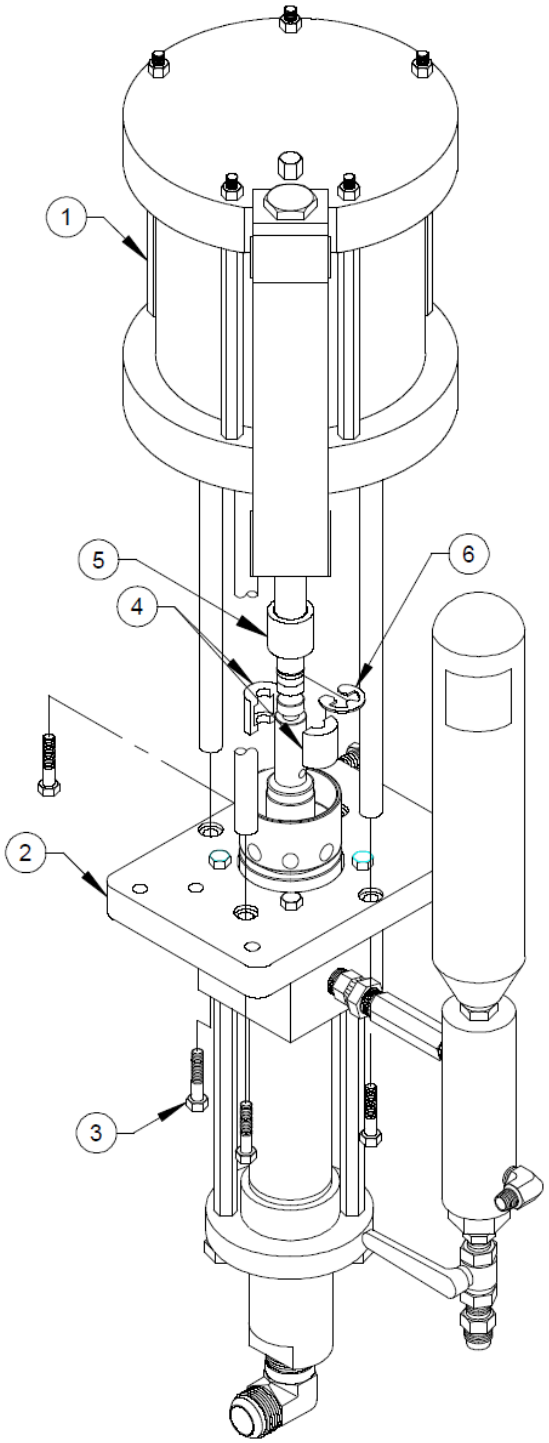
PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
1	VLS-4600-MP	1	FLUID SECTION ASSEMBLY
2	FF-5000-30	1	FLUID FILTER
3	SC-6000-1	1	SURGE CHAMBER
4	PF-HN-08	1	NIPPLE
5	PF-HN-12SC-08	1	NIPPLE
6	PF-ME-08	1	MALE ELBOW
7	PF-HN-04	1	NIPPLE
8	PF-HN-04-04S	1	NIPPLE
9	BV-44-HP	1	BALL VALVE
10	PF-SW-12M-08F	1	SWIVEL FITTING
11	PF-ME-16J-16	1	MALE ELBOW
12	O-V-210	1	O-RING

Optional Parts and Assemblies

PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
	SC-6000	1	SURGE CHAMBER ASSEMBLY (ITEMS 3, 5, & 12)



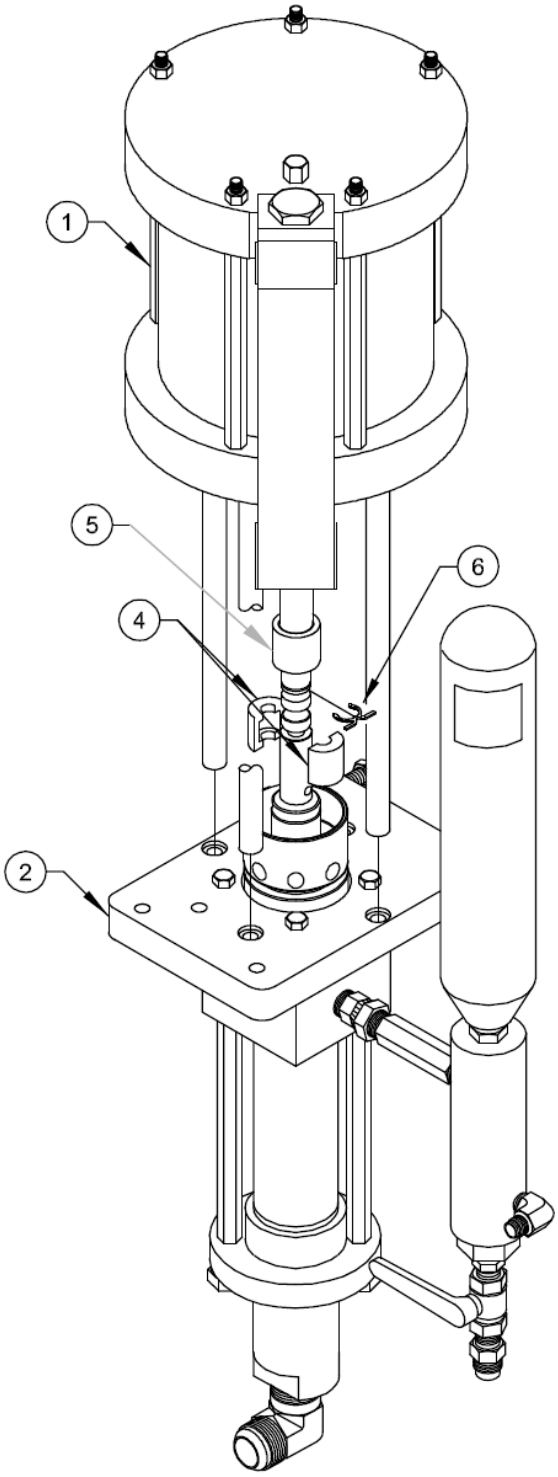
MAGNUM VENUS PRODUCTS

31 : 1 COMPLETE PUMP ASSY	VP-3100

REV. - 01-09-07 BT2

31:1 Complete Pump Assy VP-3100
PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
1	VPH-7000	1	POWER HEAD ASSY
2	VLS-4600-1	1	FLUID SECTION ASSY
3	F-HB-06C-24-GR8	4	HEX HEAD BOLT
4	APP-9096	2	CONNECTOR
5	APP-9109	1	SLEEVE
6	APP-9102	1	RETAINER RING



MAGNUM VENUS PLASTECH

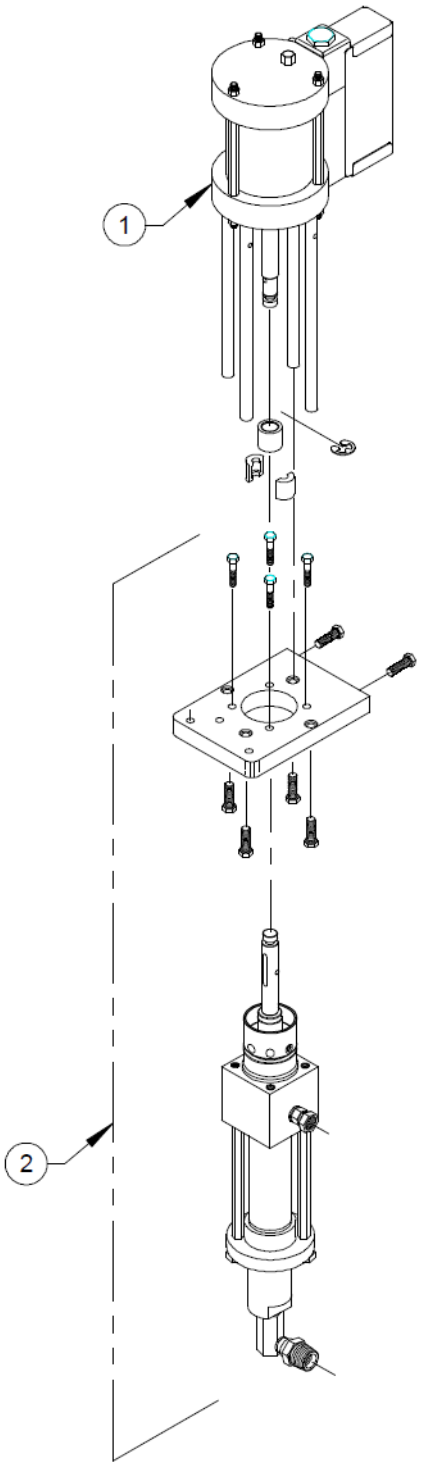
31 : 1 COMPLETE PUMP ASSEMBLY	VP-3100-HD

REV. - 05-03-10 BT2

31:1 Complete Pump Assy VP-3100-HD
PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
1	VPH-7000-HD	1	POWER HEAD ASSY
2	VLS-4600-1-HD	1	FLUID SECTION ASSY
4	VPH-10009	2	HALF SHELL
5	PAT-PA-9110	1	SHELL RETAINER
6	PAT-PA-9112	1	SLEEVE CLIP

NOTE: F-HB-06C-24-GR8 CONNECTION BOLTS ARE INCLUDED WITH POWER HEAD



MAGNUM VENUS PRODUCTS

Complete Pump Combo	VP-41100

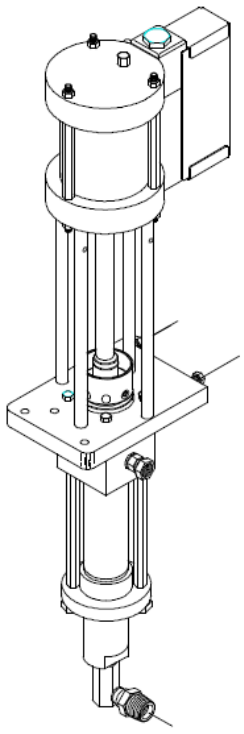
REV. A = ITEM ONE VPH-4250 WAS 2101-00-01 1/24/03 JEM
REV. B = ITEM 2 VLS-4600 WAS VLS-2500 9/21/06 JEM

VP-41100-DWG REV. - 10-3-01

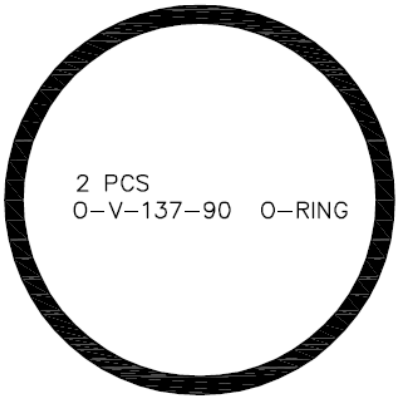
Complete Pump Combo VP-41100
PARTS LIST

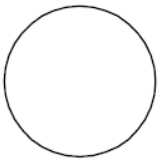
ITEM	PART NO.	QTY	DESCRIPTION
1	VPH-4250	1	POWER CYLINDER ASSY
2	VLS-4600	1	FLUID SECTION ASSY

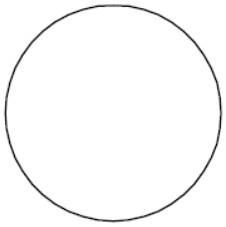
FIGURE 1-1



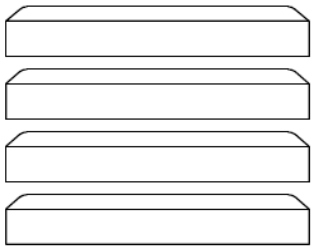
VLS-46RK-4T-2T
REPAIR KIT - FLUID SECTION



1 PC  ALS-1018 7/8" BALL

1 PC  VLS-4622 1-1/4" BALL

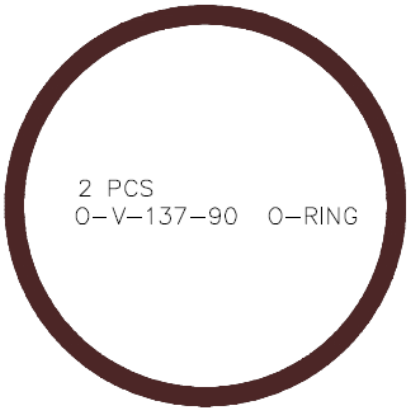
2 PC
VLS-4615 PISTON CUP



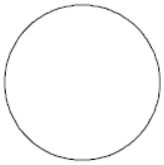
1 SET OF 4
VLS-4605 PISTON ROD SEALS

1 PC
6706-2-1 1oz WHITE GREASE

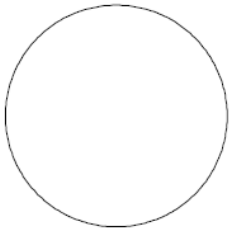
VLS-46RK-4T-2T-SS
REPAIR KIT - FLUID SECTION



2 PCS
O-V-137-90 O-RING

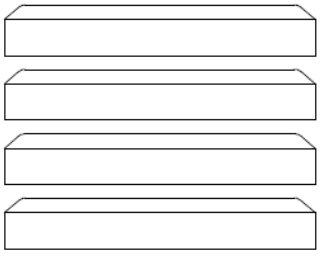


1 PC 03071 7/8" BALL



1 PC VLS-4622-SS 1-1/4" BALL

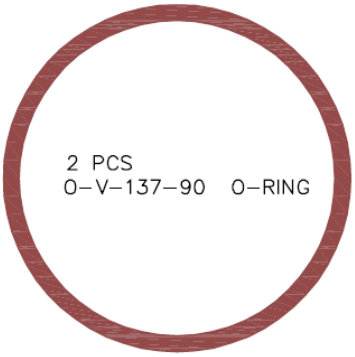
2 PC
VLS-4615 PISTON CUP

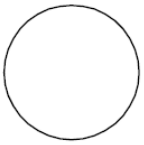


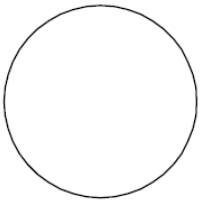
1 SET OF 4
VLS-4605 PISTON ROD SEALS

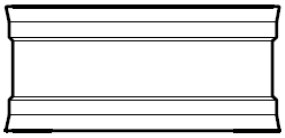
1 PC
6706-2-1 1oz WHITE GREASE

VLS-46RK-MP
REPAIR KIT - FLUID SECTION

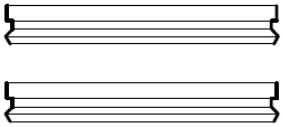


1 PC  ALS-1018 7/8" BALL

1 PC  VLS-4622 1-1/4" BALL

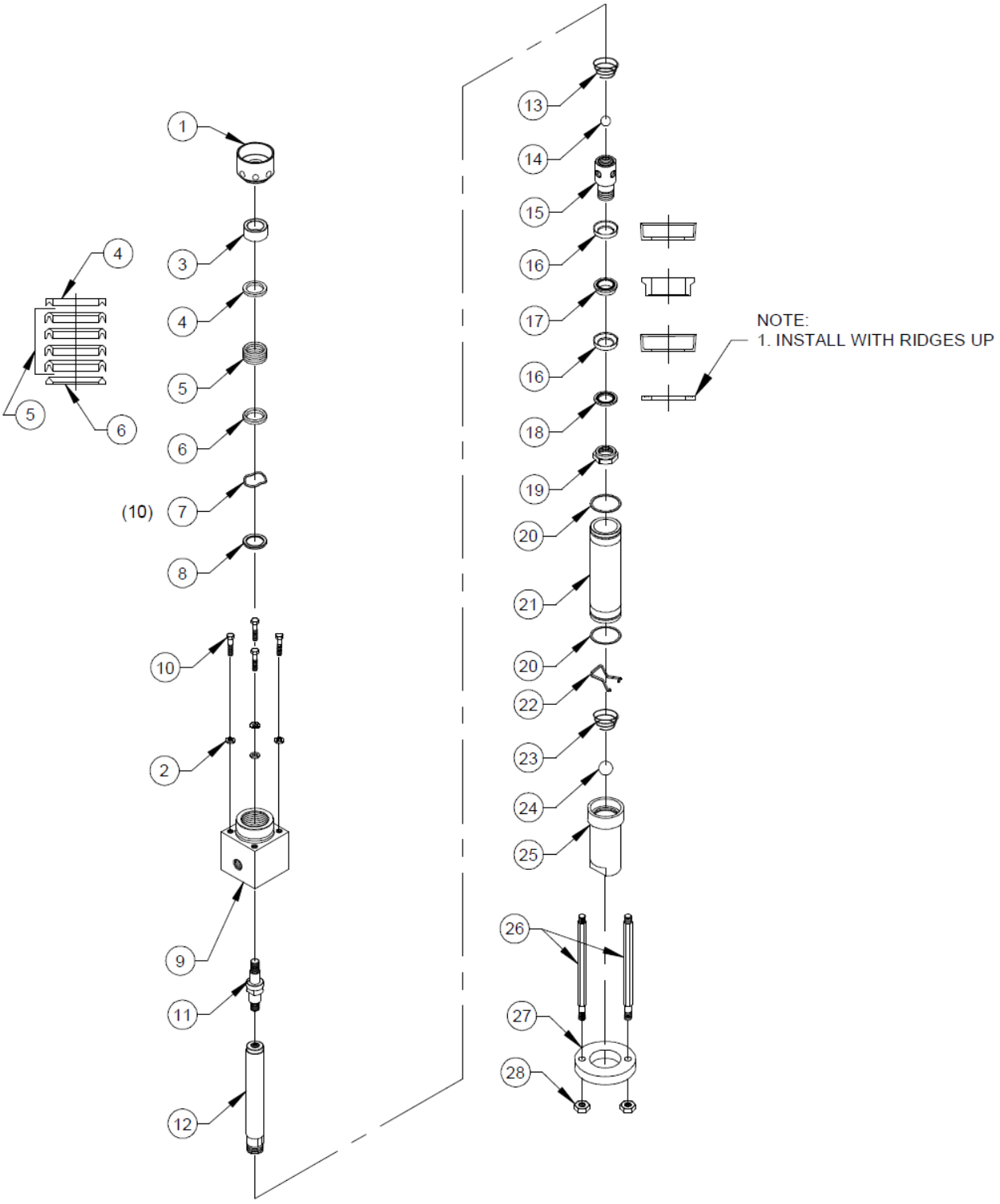


1 PC
VLS-4633 PISTON ROD SEAL



2 PCS
VLS-4640 PISTON ROD SEAL

1 PC
6706-2-1 1oz WHITE GREASE



MAGNUM VENUS PRODUCTS

FLUID SECTION ASSEMBLY	DLS-4600

REV. 10/24/03 JEM
REV. A - REPAIR WAS 6702-01-01 05/31/07 BT2
REV. B - ADDED ITEM 2 F-SW-06 10/05/07 BT2

Fluid Section Assy DLS-4600

PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
1	VLS-4607	1	SOLVENT CUP PKG NUT
2	F-SW-06	4	LOCK WASHER
3	VLS-4603	1	GUIDE BEARING
4	VLS-4604	1	FEMALE COMP RING
5	VLS-4605	1	PACKING SET SPA
6	VLS-4606	1	MALE COMPRESSION RING
7	VLS-4610	10	WAVE SPRING
8	VLS-4611	1	SPRING SUPPORT RING
9	VLS-4601	1	OUTLET BODY
10	F-HB-06C-24-GR8	4	HEX HEAD BOLT
11	DLS-4613	1	PISTON ROD ADAPTER
12	VLS-4609	1	PISTON ROD
13	VLS-4614	1	PISTION BALL SPRING
14	ALS-1018	1	7/8" CHROME BALL
15	VLS-4619	1	PISTON BODY
16	VLS-4615	2	PISTION CUP
17	VLS-4616	1	PISTON CUP SPACER
18	VLS-4617	1	PISTON CUP BACK-UP
19	VLS-4618	1	PISTON NUT
20	O-V-137-90	2	O-RING
21	VLS-4608	1	CYLINDER
22	VLS-4620	1	BALL STOP
23	VLS-4621	1	FOOT VALVE BALL SPRING
24	VLS-4622	1	1 1/4" CHROME BALL
25	VLS-4602	1	FOOT VALVE
26	VLS-4623	2	PUMP CYLINDER TIE ROD
27	VLS-4624	1	FOOT VALVE COLLAR
28	F-HN-08C	2	1/2" UNC HEX NUT

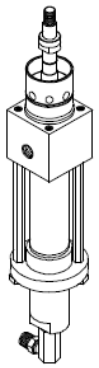
REPAIR KITS

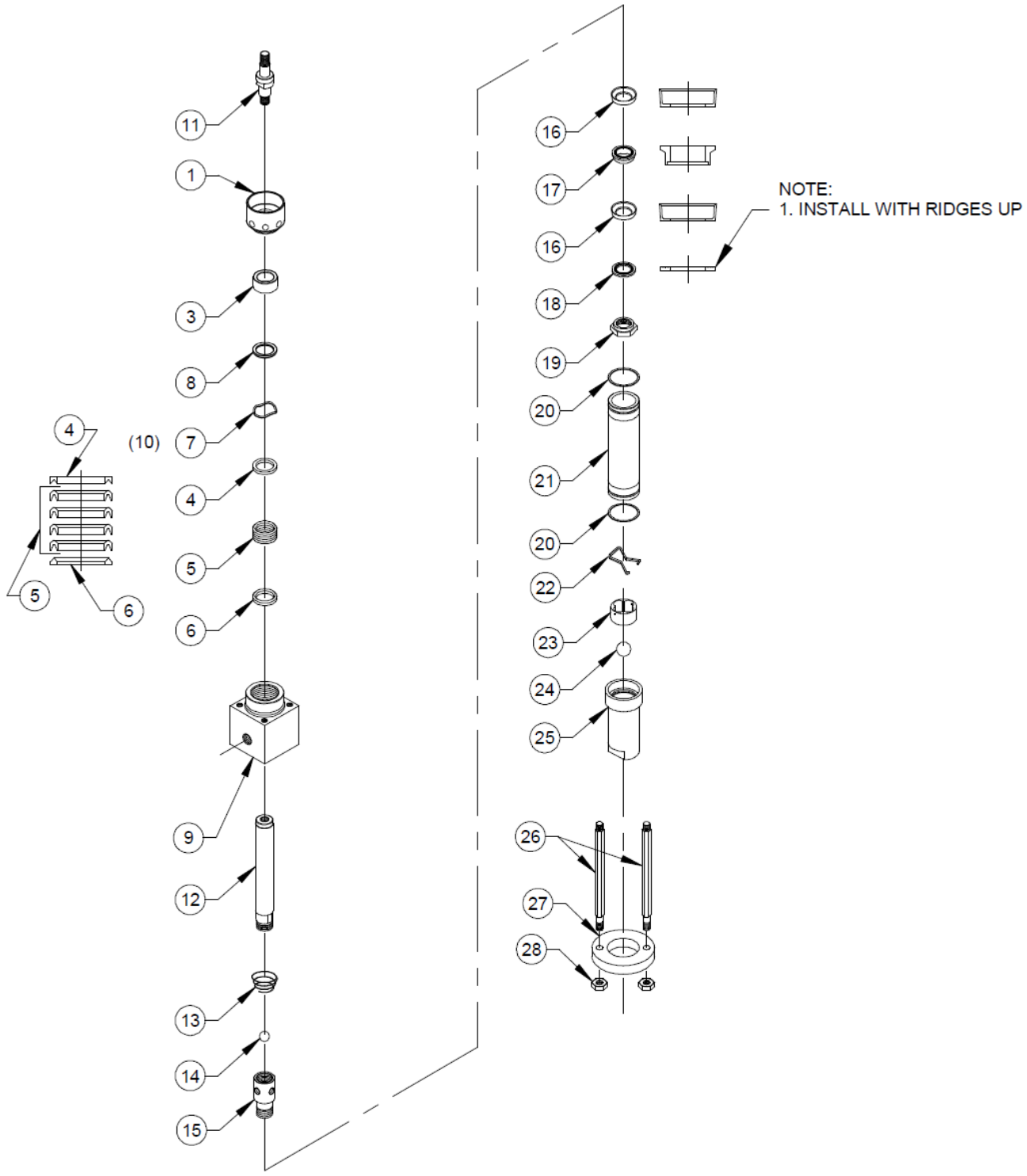
PART NO.	DESCRIPTION
VLS-46RK-4T-2T	REPAIR KIT

TOOLS

PART NO.	DESCRIPTION
45011-1	PISTON BODY WRENCH

FIGURE 1-A





MAGNUM VENUS PRODUCTS

FLUID SECTION ASSEMBLY	DLS-4600-SS

REV. A = ITEM S 14 & SS WERE 316 SS 9/20/04 JEM

Fluid Section Assy DLS-4600-SS

PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
1	VLS-4607	1	SOLVENT CUP PKG NUT
3	VLS-4603	1	GUIDE BEARING
4	VLS-4604-SS	1	FEMALE COMP RING
*5	VLS-4605	1	PACKING SET SPA
6	VLS-4606-SS	1	MALE COMPRESSION RING
7	VLS-4610	10	WAVE SPRING
8	VLS-4611	1	SPRING SUPPORT RING
9	VLS-4601-SS	1	OUTLET BODY
11	DLS-4613	1	PISTON ROD ADAPTER
12	VLS-4609-SS	1	PISTON ROD
13	VLS-4614	1	PISTION BALL SPRING
*14	ALS-1018-440C	1	7/8" SS BALL
15	VLS-4619-SS	1	PISTON BODY
*16	VLS-4615	2	PISTION CUP
17	VLS-4616-SS	1	PISTON CUP SPACER
18	VLS-4617-SS	1	PISTON CUP BACK-UP
19	VLS-4618-SS	1	PISTON NUT
*20	O-E-137	2	O-RING
21	VLS-4608-SS	1	CYLINDER
22	VLS-4620-SS	1	BALL STOP
23	DLS-4602-SS	1	BALL GUIDE
*24	VLS-4622-440C	1	1 1/4" SS BALL
25	VLS-4602-SS	1	FOOT VALVE
26	VLS-4623	2	PUMP CYLINDER TIE ROD
27	VLS-4624	1	FOOT VALVE COLLAR
28	F-HN-08C	2	1/2" UNC HEX NUT

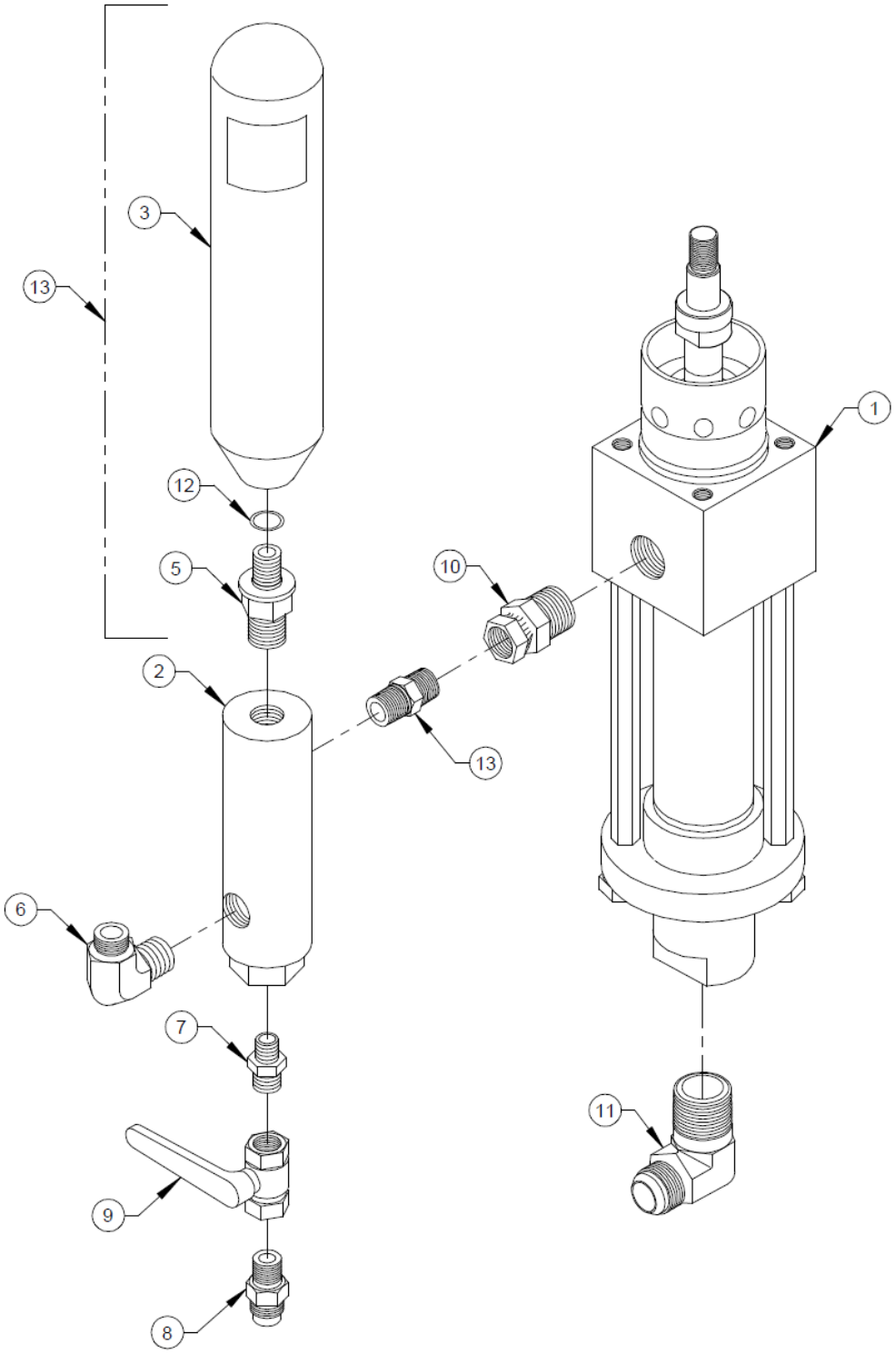
* INCLUDED IN REPAIR KIT

REPAIR KITS

PART NO.	DESCRIPTION
*DLS-4600-SS-RK	REPAIR KIT

TOOLS

PART NO.	DESCRIPTION
45011-1	PISTON BODY WRENCH



MAGNUM VENUS PRODUCTS

Fluid Section & Filter Assembly	DLS-4600-1

REV. 2/20/03 JEM
REV. A - REDREW WITHOUT MOUNTING PLATE 05/31/07 BT2

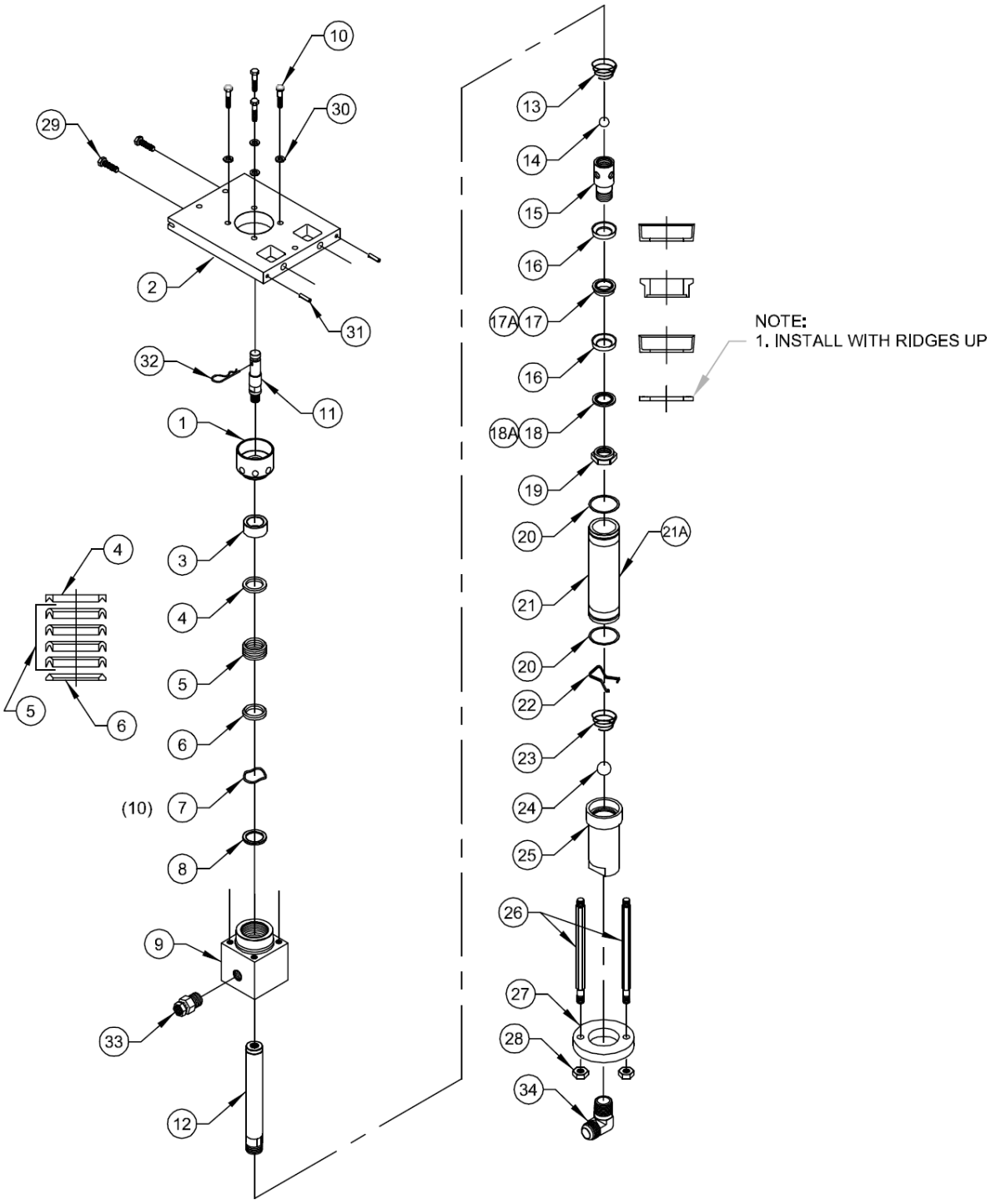
Fluid Section & Filter Assembly DLS-4600-1

PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
1	DLS-4600	1	FLUID SECTION ASSEMBLY
2	FF-5000-30	1	FLUID FILTER
3	SC-6000-1	1	SURGE CHAMBER
4	PF-HN-08	1	NIPPLE
5	PF-HN-12SC-08	1	NIPPLE
6	PF-ME-08-06	1	MALE ELBOW
7	PF-HN-04	1	NIPPLE
8	PF-HN-04-04S	1	NIPPLE
9	BV-44-HP	1	BALL VALVE
10	PF-SW-12M-08F	1	SWIVEL FITTING
11	PF-ME-16-12J	1	MALE ELBOW
12	O-V-210	1	O-RING

OPTIONAL ASSEMBLIES

ITEM	PART NO.	QTY	DESCRIPTION
13	SC-6000	1	SURGE CHAMBER ASSEMBLY



MAGNUM VENUS PRODUCTS

MULTI-COLOR FLUID SECTION ASSEMBLY	MCPA-4600

REV. - 10/11/06 BT2
REV. A - ITEM 34 WAS PF-SE-SW-16 06/25/14 BT2

Fluid Section Assembly MCPA-4600

PARTS LIST

	ITEM	PART NO.	QTY	DESCRIPTION
	1	VLS-4607	1	SOLVENT CUP
	2	3108-1-1	1	PUMP MOUNTING PLATE
	3	VLS-4603	1	GUIDE BEARING
	4	VLS-4604	1	FEMALE COMPRESSION RING
*	5	VLS-4605	1	PACKING SET SPA
	6	VLS-4606	1	MALE COMPRESSION RING
	7	VLS-4610	10	WAVE SPRING
	8	VLS-4611	1	SPRING SUPPORT RING
	9	VLS-4601	1	OUTLET BODY
	10	F-HB-06C-24-GR8	4	HEX BOLT
	11	MCPA-2501	1	PISTON ROD ADAPTER
	12	VLS-4609	1	PISTON ROD
	13	VLS-4614	1	PISTON BALL SPRING
*	14	ALS-1018	1	7/8" BALL
	15	VLS-4619	1	PISTON BODY
*	16	VLS-4615	2	PISTON CUP
	17	VLS-4616	1	PISTON CUP SPACER
	18	VLS-4617	1	PISTON CUP BACK-UP
	19	VLS-4618	1	PISTON NUT
*	20	O-V-137-90	2	O-RING
	21	VLS-4608	1	CYLINDER
	22	VLS-4620	1	BALL STOP
	23	VLS-4621	1	FOOT VALVE BALL SPRING
*	24	VLS-4622	1	1 1/4" BALL
	25	VLS-4602	1	FOOT VALVE
	26	VLS-4623	2	TIE ROD
	27	VLS-4624	1	FOOT VALVE COLLAR
	28	F-HN-08C	2	HEX NUT
	29	F-HB-08C-16	2	HEX BOLT
	30	F-SW-06	4	LOCK WASHER
	31	F-RP-04-16	2	ALIGNMENT PIN
	32	09528	1	HITCH PIN
	33	PF-SW-12M-08F	1	SWIVEL
	34	PF-ME-16J-16	1	SWIVEL ELBOW

REPAIR KITS

PART NO.	DESCRIPTION
* VLS-46RK-4T-2T	REPAIR KIT

TOOLS

PART NO.	DESCRIPTION
45011-1	PISTON BODY WRENCH

OPTIONAL PARTS AND ASSY PARTS LIST

ITEM	PART NO.	QTY	DESCRIPTION
	* 6706-2-1	1	PUMP GREASE
17A	3101-13-2	1	HARDENED SPACER
18A	3101-14-2	1	HARDENED BACK-UP RING
21A	3101-24-1	1	HARDENED CYLINDER

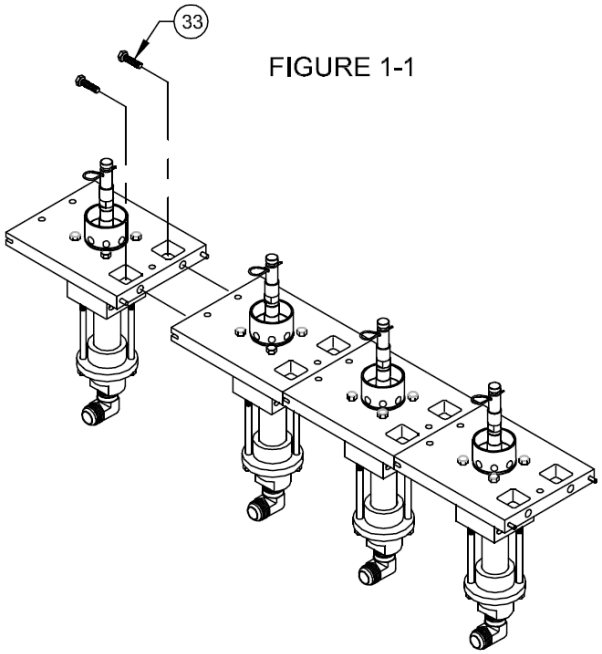
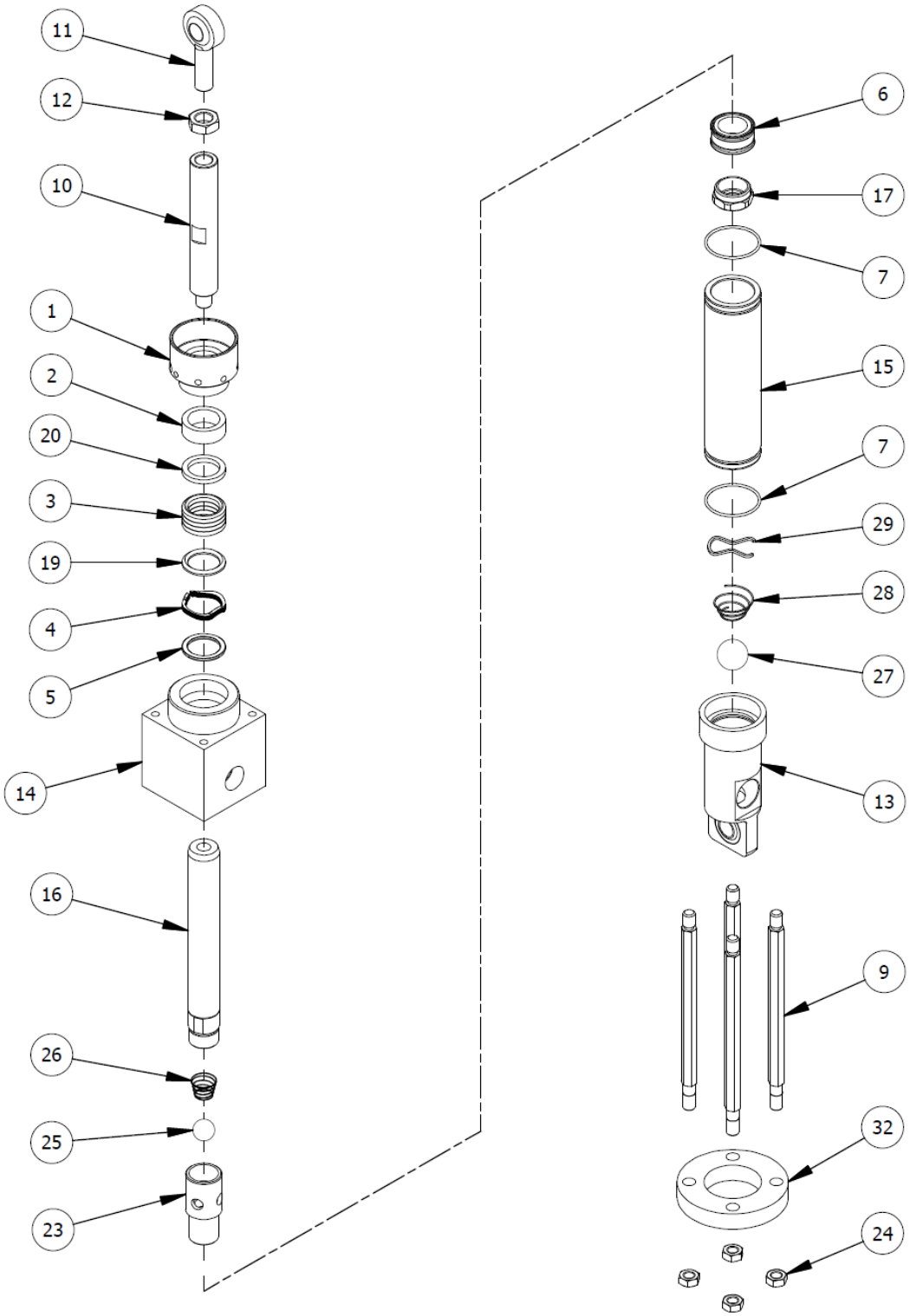


FIGURE 1-1



MAGNUM VENUS PLASTECH

LOWER SECTION	UPLS-4600

REV:B 07/03/12 SHEET 1 / 2 4/7/2010

	Parts List			
	ITEM	PART NUMBER	QTY	DESCRIPTION
	1	VLS-4607	1	SOLVENT CUP-PKG NUT
	2	VLS-4603	1	GUIDE BEARING
*	3	VLS-4605-2U2G	1	PACKING SET - PISTON ROD
	4	VLS-4610	10	WAVE SPRING
	5	VLS-4611	1	SPRING SUPPORT
*	6	VLS-4633	1	RESIN PISTON SEAL
*	7	O-V-137	2	O-RING
	9	VLS-4623	4	CYLINDER TIE ROD
	10	UPLS-4613	1	ROD ADAPTOR
	11	B-BJRE-.750-1-XS	1	BALL JOINT ROD END
	12	F-JN-12F	1	JAM NUT
	13	60327-1	1	FOOT VALVE
	14	VLS-4601	1	OUTLET BODY
	15	VLS-4608	1	CYLINDER
	16	VLS-4609	1	PISTON ROD
	17	VLS-4618	1	PISTON NUT
	19	VLS-4606	1	MALE COMPRESSION RING
	20	VLS-4604	1	FEMALE COMPRESSION RING
	23	VLS-4619	1	PISTON BODY
	24	F-HN-08C	4	HEX NUT
*	25	ALS-1018	1	7/8" BALL
*	26	VLS-4614	1	SPRING, PISTON BALL
*	27	VLS-4622	1	Ø1-1/4 CHROME BALL
*	28	VLS-4621	1	FOOT VALVE SPRING
	29	VLS-4620	1	BALL STOP
	32	87160-1	1	COLLAR

OPTIONAL PARTS

PART No.	DESCRIPTION
VLS-4633-GFT	PISTON SEAL (FIG. 1)

REPAIR KIT

PART No.	DESCRIPTION
* UPLS-46RK-2U2G-1U	REPAIR KIT

* NOTE: ASTERISKS DENOTE PARTS USED IN REPAIR KIT

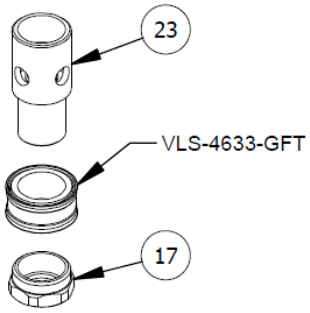
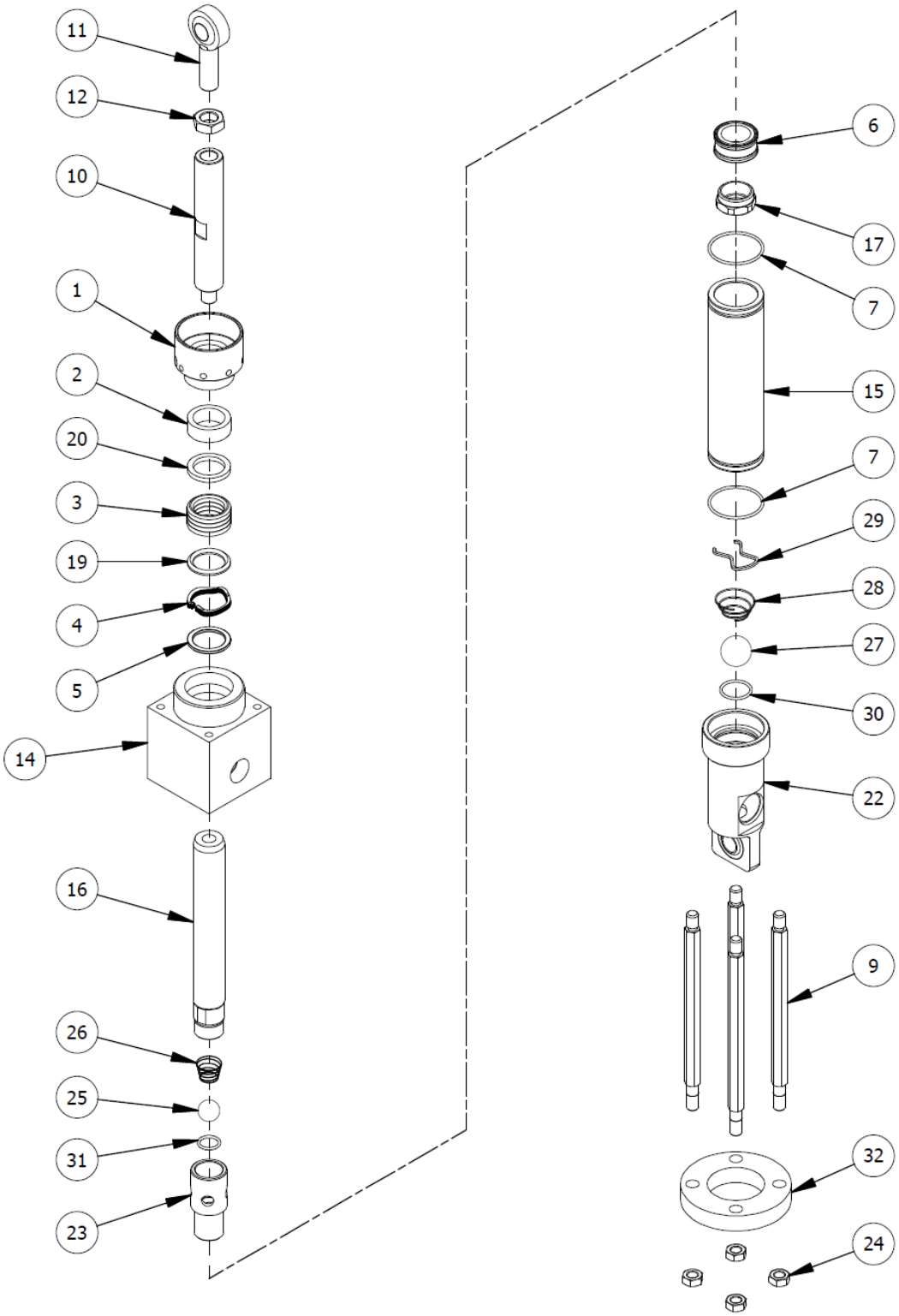


FIG. 1
OPTIONAL SEAL SETUP

MAGNUM VENUS PLASTECH

LOWER SECTION	UPLS-4600

REV: B 07/03/12 SHEET 2 / 2 4/7/2010



MAGNUM VENUS PLASTECH

LOWER SECTION	UPLS-4600-SS

REV:C 07/03/12 SHEET 1 / 2 4/7/2010

	Parts List			
	ITEM	PART NUMBER	QTY	DESCRIPTION
	1	VLS-4607	1	SOLVENT CUP-PKG NUT
	2	VLS-4603	1	GUIDE BEARING
*	3	VLS-4605-2U2G	1	PACKING SET - PISTON ROD
	4	VLS-4610	10	WAVE SPRING
	5	VLS-4611	1	SPRING SUPPORT
*	6	VLS-4633-GFT	1	PISTON SEAL
*	7	O-V-137	2	O-RING
	9	VLS-4623	4	CYLINDER TIE ROD
	10	UPLS-4613	1	ROD ADAPTOR
	11	B-BJRE-.750-1-XS	1	BALL JOINT ROD END
	12	F-JN-12F	1	JAM NUT
	14	VLS-4601-SS	1	OUTLET BODY
	15	VLS-4608-SS	1	CYLINDER
	16	VLS-4609-SS	1	PISTON ROD
	17	VLS-4618-SS	1	PISTON NUT
	19	VLS-4606-SS	1	MALE COMPRESSION RING
	20	VLS-4604-SS	1	FEMALE COMPRESSION RING
	22	UPLS-4602-SS	1	FOOT VALVE
	23	UPLS-4619-SS	1	PISTON BODY
	24	F-HN-08C	4	HEX NUT
*	25	03071	1	7/8" SS BALL
*	26	VLS-4614	1	SPRING, PISTON BALL
*	27	VLS-4622-SS	1	Ø1-1/4 SS BALL
*	28	VLS-4621	1	FOOT VALVE SPRING
	29	VLS-4620	1	BALL STOP
	30	O-K-122	1	O-RING
	31	O-K-116	1	O-RING
	32	87160-1	1	COLLAR

REPAIR KITS

PART No.	DESCRIPTION
* UPLS-46RKSS-2U2G-1G	REPAIR KIT

* NOTE: ASTERISKS DENOTE PARTS USED IN REPAIR KIT

MAGNUM VENUS PLASTECH

LOWER SECTION	UPLS-4600-SS

REV: C 07/03/12 SHEET 2 / 2 4/7/2010

Revision Information:

Rev: 04/2011 Updated manual format, added revision information chapter, added Accumulator chapter, added Air Lock chapter, added Trouble shooting chapter, updated drawings, updated back cover with MVP information, numbered pages and added footer.

Rev: 05/2011 Added the information for the UPLS-4600 & UPLS-4600-SS Fluid Sections.

Rev: 07/2011 Updated the drawings for the VLS-4600-1, VLS-4600-1-FIT, VLS-4600-1-FIT-HD & VLS-4600-1-HD Fluid Sections. Included optional Packing Sets section.

Rev: 05/2012 Updated the manual format, Address, Logo. Added an optional Piston Cup / Piston Cup Seal section. Added the ISO Oil and Grease references. Included optional metering pump ratios and references. Added the Terms & Conditions of Sale section to the manual.

Rev: 08/2013 Updated the Terms & Conditions section, Drawings UPLS-4600 and UPLS-4600-SS in the manual. Removed Plastech address and information.

Rev. 07/2014 Updated the Logo and Name. Updated several of the drawings. Removed reference to Plastech.

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E-mail: info@mvpind.com · www.mvpind.com

Assemblies Covered in this Manual:

VLS-4600	Fluid Section Assembly
VLS-4600-HD	Fluid Section Assembly – Heavy Duty
VLS-4600-HD-SS	Fluid Section Assembly – Heavy Duty – Stainless Steel
VLS-4600-MP	Fluid Section Assembly – Magnapak
VLS-4600-SS	Fluid Section Assembly – Stainless Steel
DLS-4600	Fluid Section Assembly – Duo Unit
DLS-4600-SS	Fluid Section Assembly – Duo Unit – Stainless Steel
MCPA-4600	Fluid Section Assembly – Multi Color units
UPLS-4600	Fluid Section Assembly – Universal Proportioner
UPLS-4600-SS	Fluid Section Assembly – Universal Proportioner – Stainless Steel